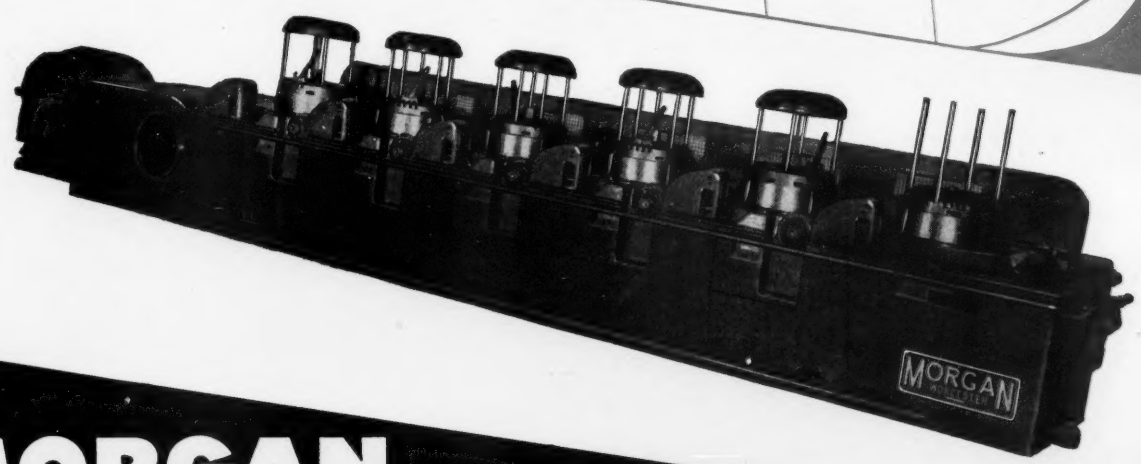
WIRE AND WIRE PRODUCTS

JUNE 1951

June 1951

SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY

Now is the time to find the effect that new Morgan-Connors will have on your output and costs

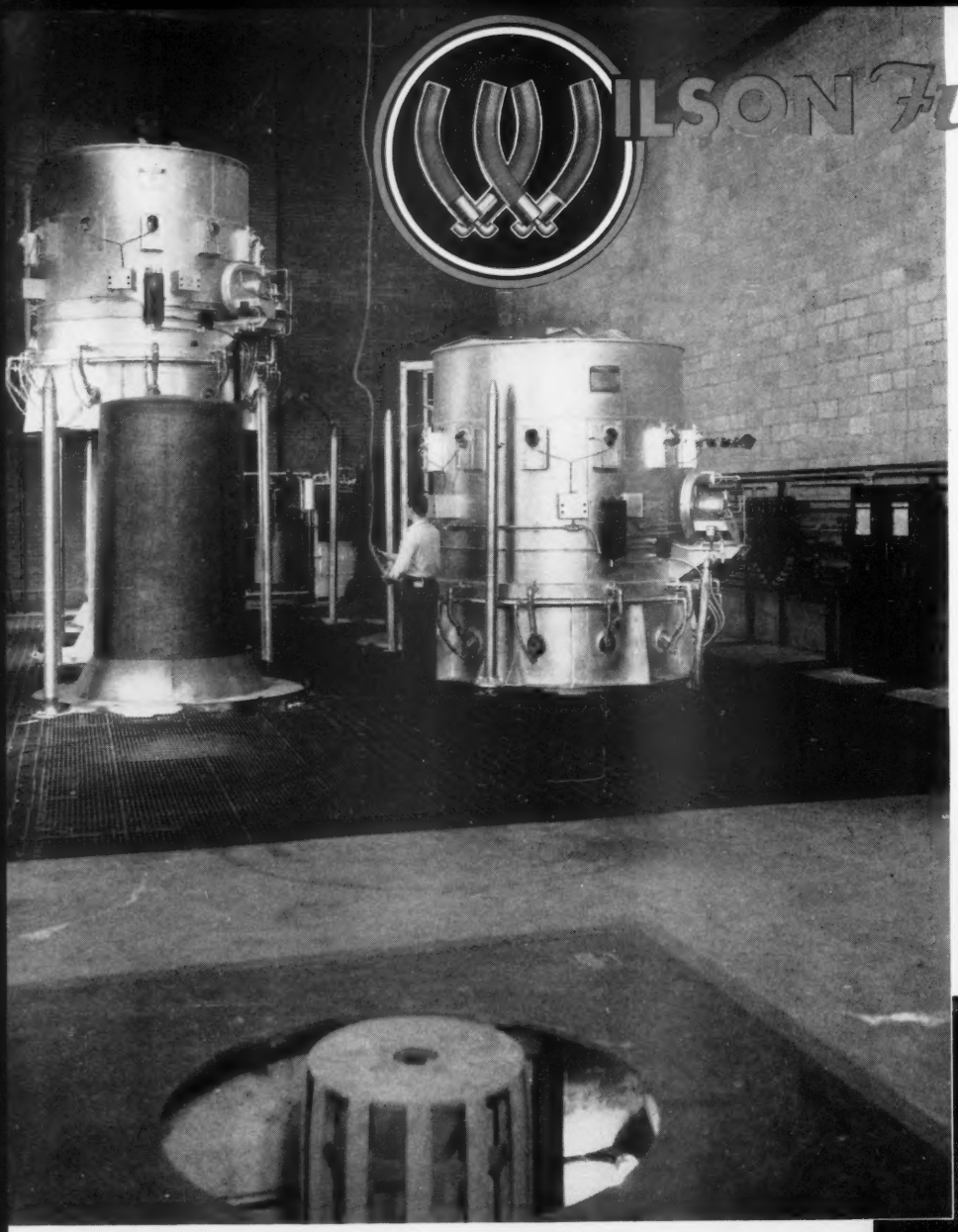


WM 48

MORGAN CONNOR WIRE MACHINES

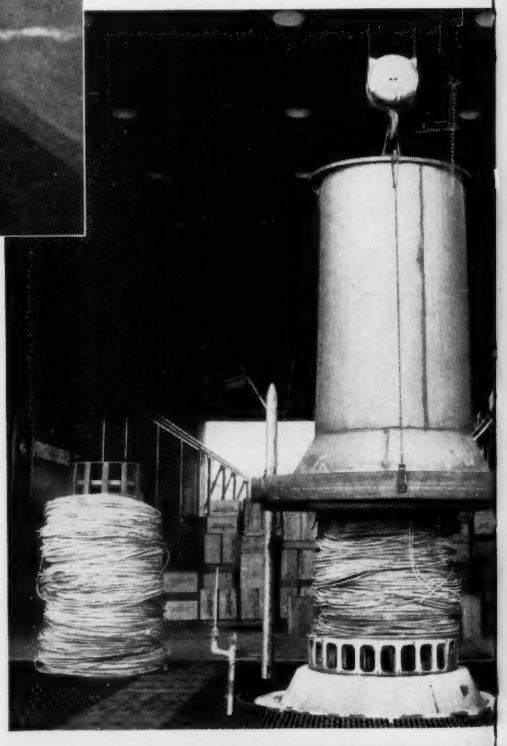
MORGAN CONSTRUCTION CO.
WORCESTER, MASSACHUSETTS

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION



WILSON *Furnaces* f

ROD AND WIR COIL SPHEROIDIZIN



Wilson Furnaces like these are in use at such plants as Lamson & Sessions Co., National Screw & Mfg. Co., and 3 plants of Russell, Burdsall, & Ward Bolt & Nut Co., for converting available rod sizes and analyses to useable sizes and physical properties for vital cold heading operations. There are other installations and most are equipped with atmosphere generating equipment to control decarburization.

Lee Wilson

ENGINEERING *Co., Inc.*

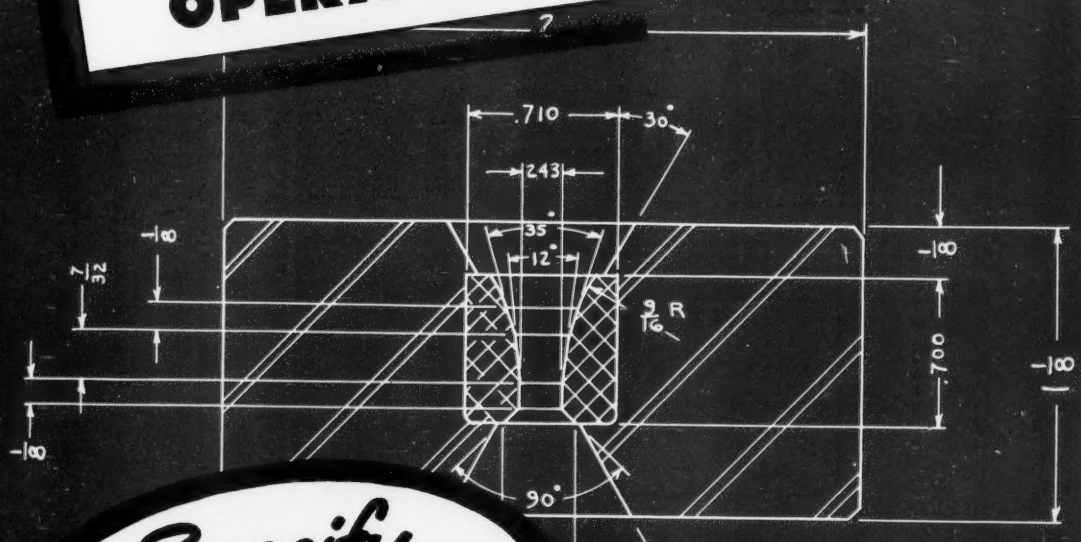
20005 WEST LAKE ROAD • CLEVELAND, OHIO

Telephone ED-1-6600

BELL TYPE FURNACES • RADIANT TUBE HEATING • ANNEALING PROCE

JUNE

Memo to: ECONOMY-MINDED WIRE MILL OPERATORS



Specify Firthaloy

PRODUCTS: WIRE DRAWING DIES	
FOR: WIRE DRAWING DIVISION	
SIZE: R-6 FINISHED	HOLE: .243
SPECIFY: FIRTHALOY	
DRWG APVD: [signature]	DATE: [illegible]-51
RVSNS: NONE	

R-225

Firth Sterling
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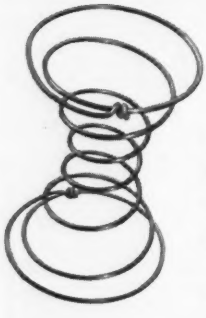

It has that comfortable "give"

Made from our Silver Star Spring Wire, this upholstery spring suggests the resilient, buoyant action that makes steel so comfortable—for sleeping, sitting, or riding. Whether it be a sleeping baby or a husky truck driver, steel springs deflect gently, and in exact proportion to the loads placed on them.

Silver Star is engineered just for coiled upholstery springs. It's a special-analysis, high-carbon steel that we process carefully in our modern wire mills. It knots and coils easily. And because of its unfailing uniformity, it can be relied on to make lively springs that will stand up under hard service.

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Silver Star SPRING WIRE BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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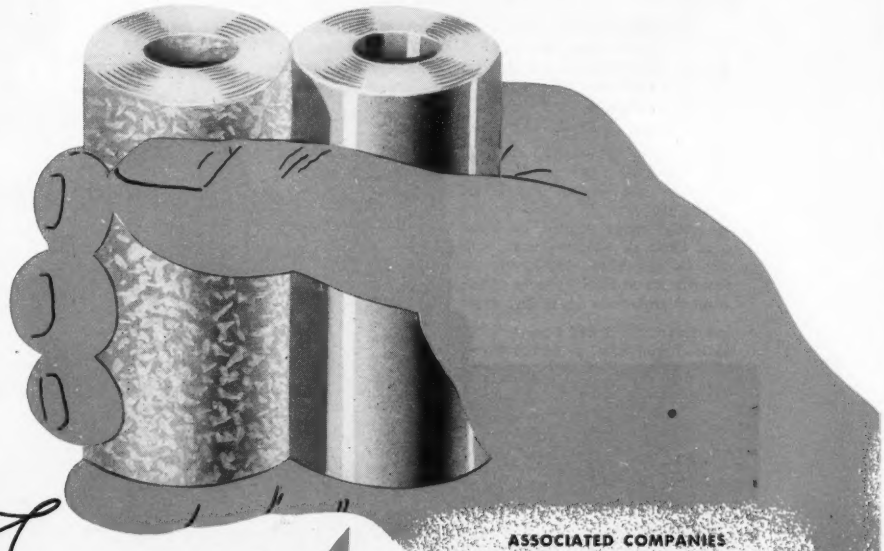
aetna-standard makes the EQUIPMENT

which
makes possible the
CONTINUOUS
COATING
LINES



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Plants in Warren, Ohio . Ellwood City, Pennsylvania

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HOW THIS WATERBURY-FARREL WINDER puts trolley wire in its place

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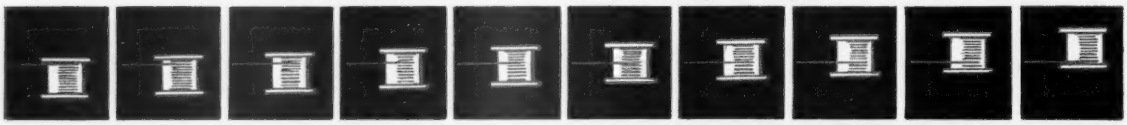
The wire moves straight ahead while the spool itself traverses. It moves across the path of the wire at exactly the right pace to put the wire precisely where it belongs on the spool. A special slip friction device compensates for the build-up of the spool.

This machine can be furnished to take spools up to 56" O.D., 31" barrel with a 26" traverse. It has a maximum capacity of 7,500 lbs. of wire plus approximately 1,800 lbs. for the spool . . . a total load of 9,300 lbs.

Further information on this machine or on any of the equipment indicated below is available on request.

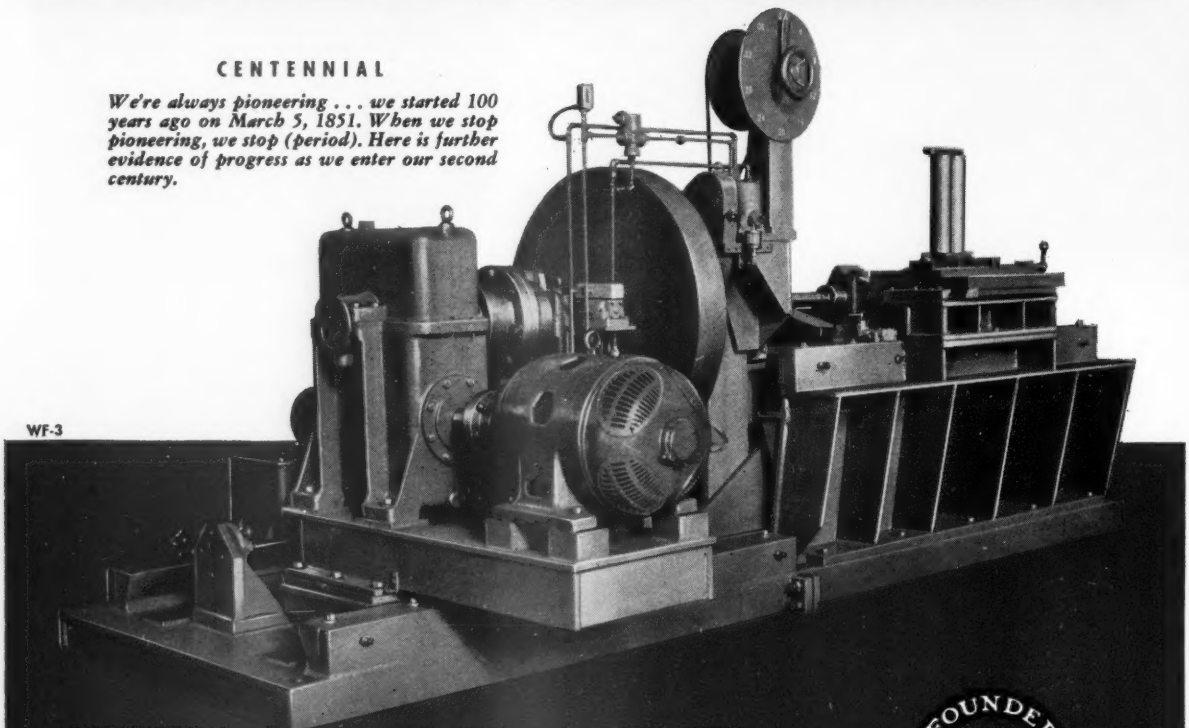
WATERBURY FARREL FOUNDRY & MACHINE COMPANY
WATERBURY, CONNECTICUT, U. S. A.
Sales Offices: Chicago, Cleveland and Newark

The spool traverses . . . the wire stays straight



CENTENNIAL

We're always pioneering . . . we started 100 years ago on March 5, 1851. When we stop pioneering, we stop (period). Here is further evidence of progress as we enter our second century.



WF-3

A FEW OF THE MANY TYPES OF METAL WORKING MACHINERY MADE BY WATERBURY FARREL

WIRE MILL EQUIPMENT—Continuous Fine Wire Drawing Machines • including Upright Cone and Tandem types • Bull Blocks • String-up Machines • Spoolers, Etc. • *COLD PROCESS BOLT AND NUT MACHINERY*—Headers (all types) • Re-headers • Trimmers • Thread Rolling Machines • Slotters • Nut Tappers, etc. • *POWER PRESSES*—Crank • Cam and Toggle; also Rack and Pinion Presses • Transfer Presses • Multiple Plunger Presses • Hydraulic Presses, etc. • *MILL MACHINERY*—Rolling Mills • Wire Flattening Mills • Chain Draw Benches • also Slitters • Straighteners • Pointers Swagers • Cut-off Saws • Coilers • Winders, etc.

FOUNDED
WATERBURY FARREL
1851

In Equipment, Experience Counts . . . We're 100 in '51!

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Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 26 JUNE, 1951 No. 6

Designated as Official Publication By The Wire Association

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Transverse Rupture Strength (psi)	275,000
Compressive Strength (psi)	750,000
Modulus of Elasticity (psi) (Deflection)	95,000,000
Co-efficient of Thermal Expansion (per ° F.)	3.00×10^{-6}
Torsion Strength (Shearing Stress psi)	125,000
Tensile Strength (psi)	150,000
Impact Strength, Ft. Lbs. (½" Square Specimens)	9.5

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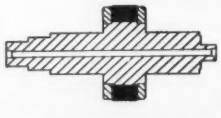
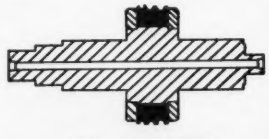


SLEEVED ROLLS FOR FLAT WIRE



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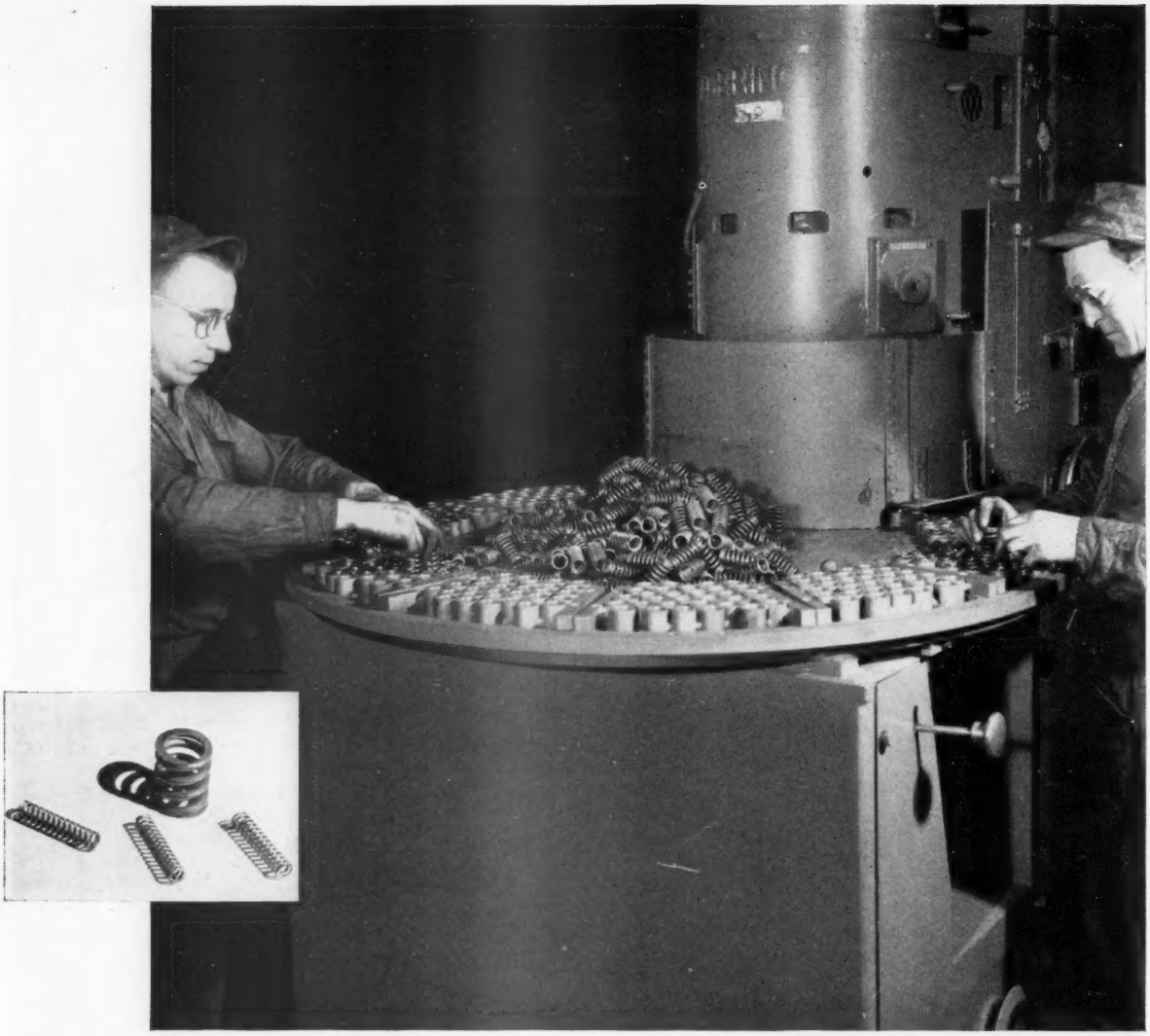

Grinding both ends of automotive valve springs, using ALUNDUM discs on a double-disc grinder.

You can SAVE MONEY AT BOTH ENDS OF THIS JOB!

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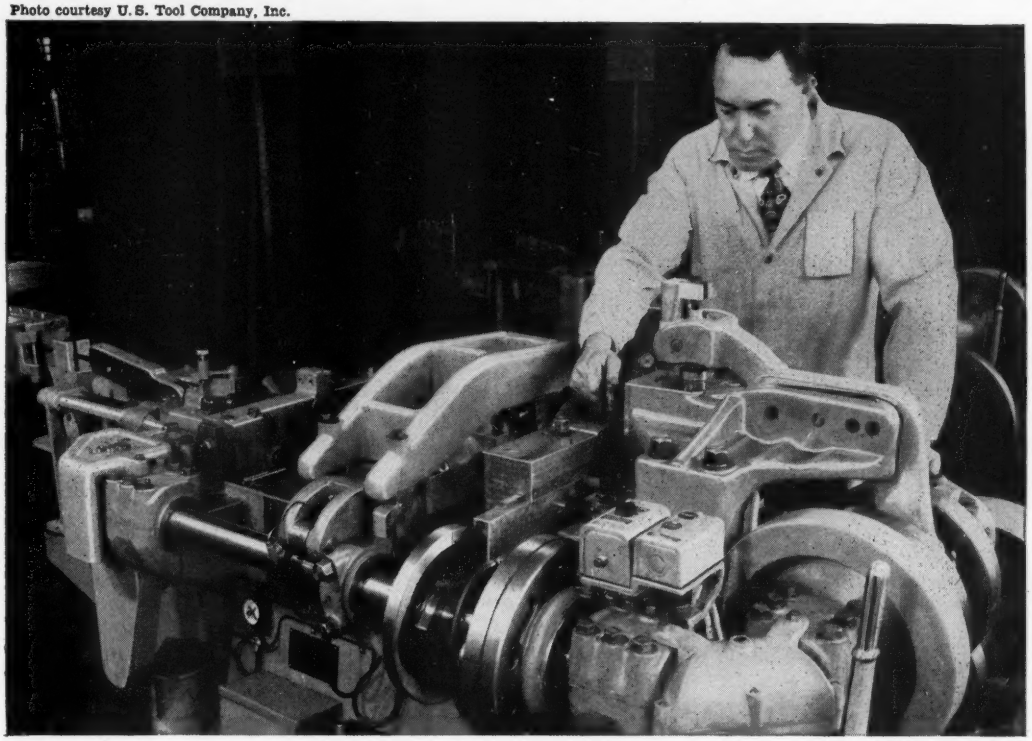
FLAT SPRING STEEL

Photo courtesy U. S. Tool Company, Inc.



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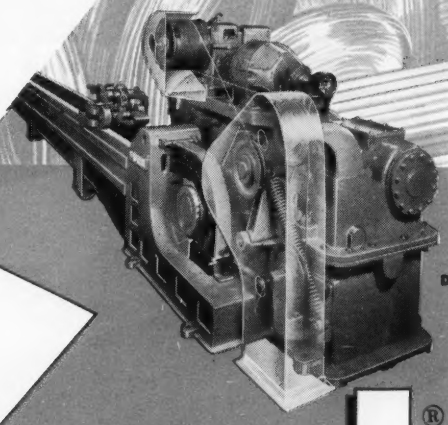
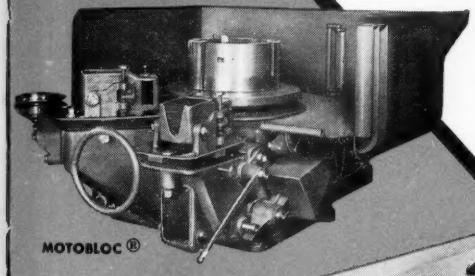


DRAW BENCH



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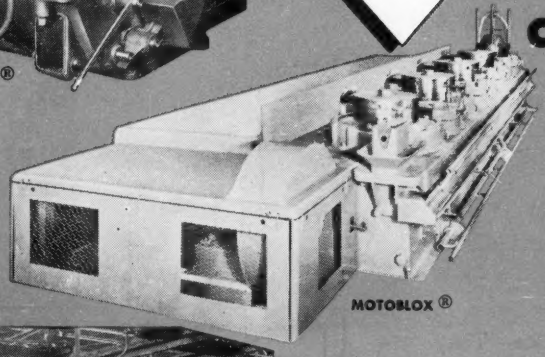

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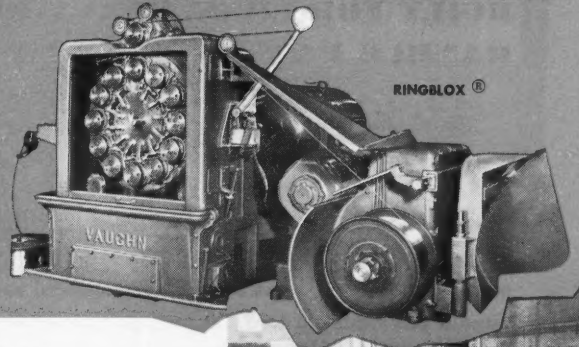

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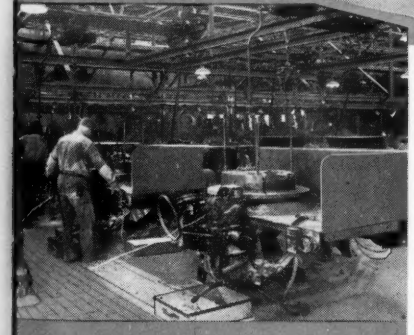

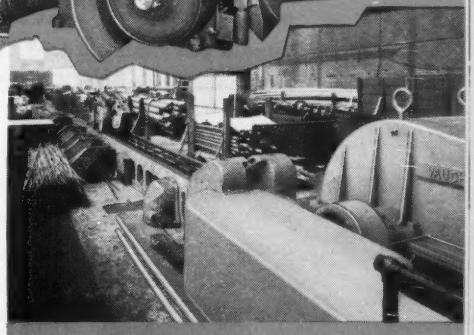

Whether your need is for a single Motobloc or a battery of integrated wire drawing machines—one small draw bench or the largest in the field—call in Vaughn for the recommendations, quotations, installation facts and figures that will give you the *dependable* solution to your production problems!

The Vaughn Machinery Co.

Cuyahoga Falls, Ohio, U.S.A.

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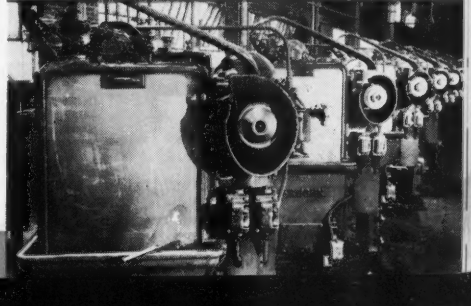


MODERNIZE YOUR PICKLING *and* MATERIAL HANDLING OPERATIONS *with* WELDCO LIGHTWEIGHT HAIRPIN HOOKS

THEY'RE CORROSION-RESISTANT-- BUILT FOR LONG, HEAVY-DUTY SERVICE-- HANDLE PAYLOADS UP TO 5000 POUNDS!

Steel mills and manufacturing plants throughout the country are cutting pickling costs and speeding up production with Weldco hairpin hooks, like the ones shown above. Made of hot-rolled Monel — or Stainless Steel — these sturdy hooks are lightweight but *tough* . . . withstand acid solutions . . . give years of long, economical service. They handle payloads up to 5,000 pounds, are exceptionally corrosion-resistant, and outlast heavy cast hooks 2 to 3 times.

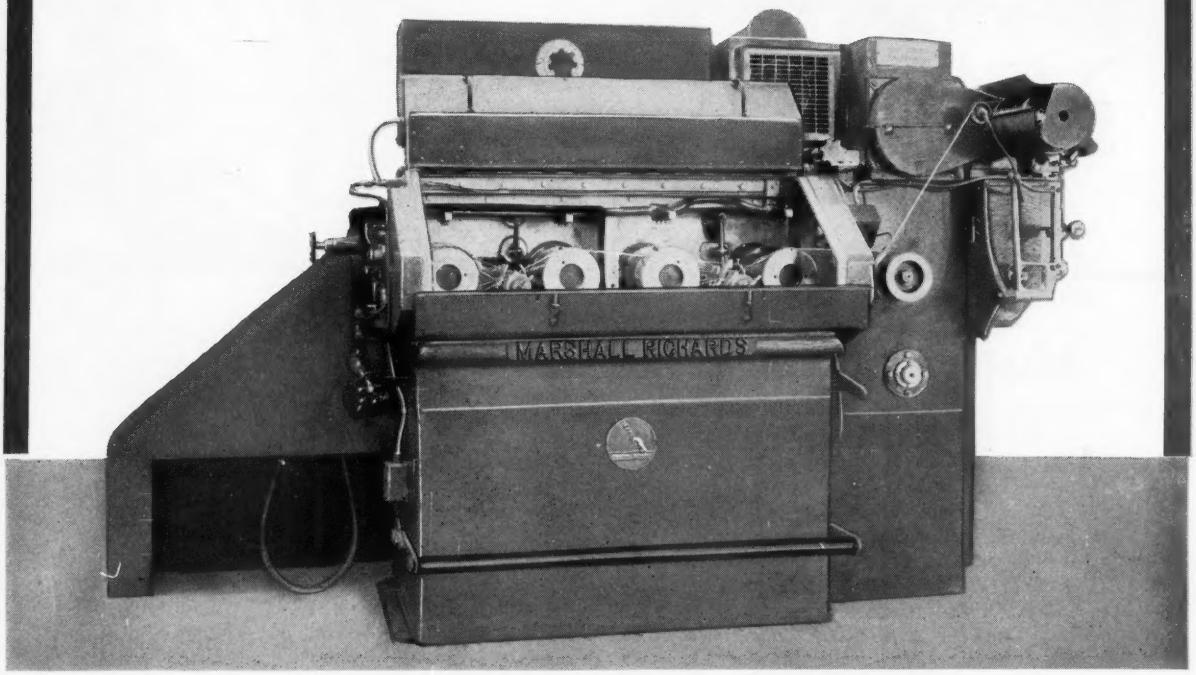
Weldco hairpin hooks are used in the nation's leading wire and rod mills, because their superior design makes them readily adaptable to all types of handling equipment. Let us show you how these lightweight corrosion-resistant hooks can cut pickling costs and improve your production methods. Your phone call or letter will bring complete information on these high-strength pickling aids — these hooks made for easy handling . . . for long, economical, heavy-duty service.

OTHER WELDCO
PICKLING PRODUCTS
Include Mechanical Picklers, Baskets, Chain, Pickling Crates, and Jets. Write for our free descriptive booklets.

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
3800 OAKWOOD AVENUE . . . . . YOUNGSTOWN 9, OHIO

Now—cut production costs of drawing

COPPER FINE WIRES



A RANGE OF SIZES from .010" to .003"! Speeds of 5350 and 8000 feet per minute... on spools to 60 lbs. capacity. That's what you get with this 16-die Marshall Richards machine drawing from an inlet diameter of .036" and driven by a 2-speed A. C. motor.

Write for full information on this machine or on the full Marshall Richards line. For drawing any size of wire from .0004" to 1", in any metal, there's a machine that will assure top efficiency, economical operation and unsurpassed uniformity of product. All Marshall Richards machines are produced in England and you will find that deliveries are often surprisingly prompt.

MARSHALL RICHARDS MACHINE COMPANY, INC.

1100 BROAD STREET, TRENTON 10, NEW JERSEY
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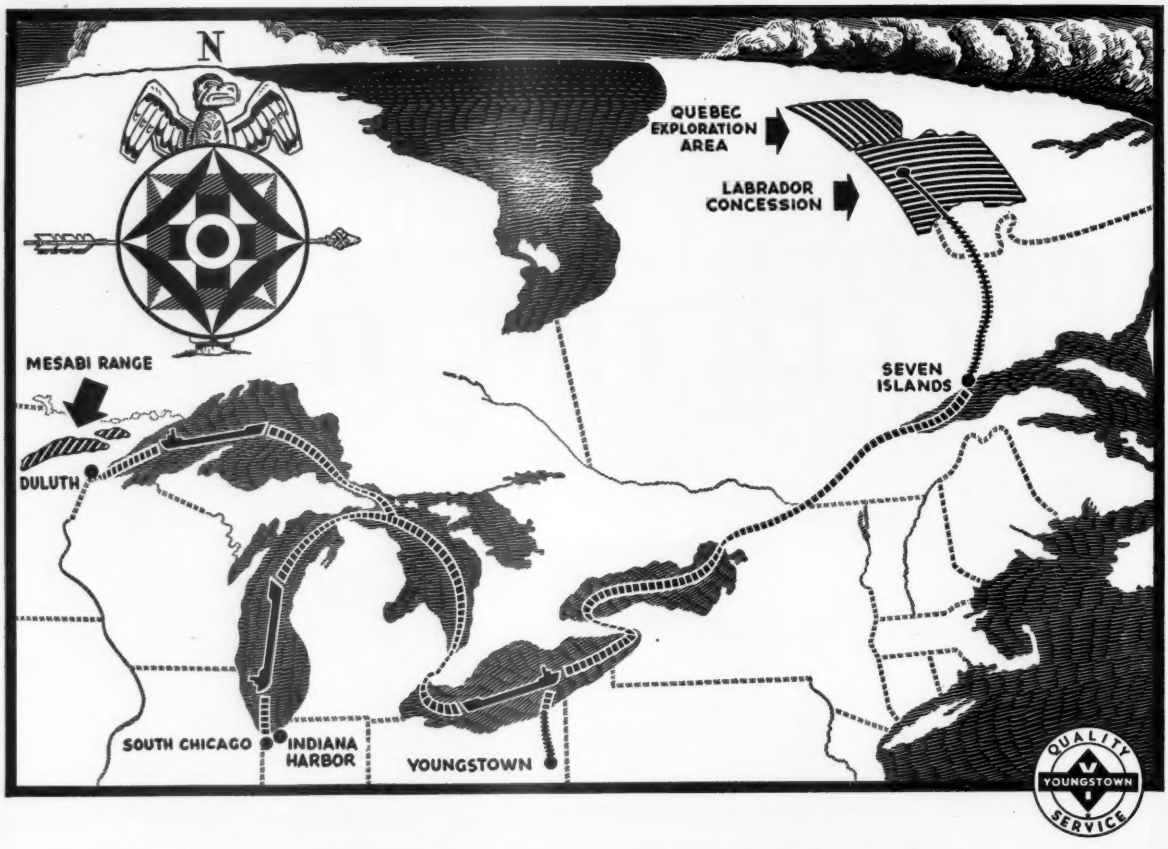
DRAW ON OUR EXPERIENCE



Mister, can you spare Half a Billion Dollars?

ONE half a billion dollars may seem like pin money compared to the sums mentioned for our national finances.

But it is more than three dollars for each man, woman and child in the United States. It is more than the entire steel industry earned in the "dreadful decade" from 1930 to 1939. It's more than America spent to win two wars--the War of 1812 and the Mexican War, combined.

Approximately one half a billion dollars is the estimated sum that a group of steel and mining companies, one of which is The Youngstown Sheet and Tube Company, is investing to guarantee future iron ore supplies for America. In the Mesabi iron range of Minnesota, development projects are under way which will produce millions of tons of iron concentrates from taconite. In Labrador and Quebec, a vast deposit of high grade ore is being developed. Plans include building a 360-mile railroad into the wilderness to ore docks on the St. Lawrence River.

Where does this money come from? From an unnoticed addition to our national debt? From "extra nickels" tucked away in the Federal budget? From more taxes levied on every citizen's income? *Certainly not!* Development of these ore reserves will be financed by each participating Company asking its shareholders to share in its tremendous cost.

America, in peace or in war, is served--now --and for generations to come. This is free enterprise. This is the system that created America from a wilderness and is the only sure way to keep it vigorous and strong.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
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MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

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We're READY with quality soaps for every wire drawing need! You can always find the right soap for the job in Swift's complete line. Whatever your specialized need, Swift's Soap Department can fill it. And you'll find that Swift's Soaps for wire drawing uses have efficient lubrication, minimum dusting and dependable uniform quality. You can't buy finer soaps anywhere.

WILLING to continue Swift's research laboratory activities to develop better products for your purpose! Our technical division is constantly working on wire drawing problems. This means that Swift Soap products always have the quality and effectiveness to help you get better results.

And ABLE to give fast service from Swift distribution points coast to coast! You can order any of the fine soaps listed below and expect immediate delivery. Remember—use good soap and enough of it! Good soap promotes economy for you . . . better products for your customers. *Powdered White Ribbon* • *Guaranteed Powder* *Snap Heavy Duty Wire Drawing Powder No. 282* *No. 559 Powdered Soap*

Plus

other special formulations to meet your specifications.

See your local Telephone Directory for address of your nearest

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has the fine temper that makes better wire products

You can, quite literally, bend Chase brass, copper and bronze wire to your will because it has precisely adjusted temper, excellent ductility and great tensile strength.

For coining or embossing, heading and extruding, heading and drilling, making of rivets, screws, springs you'll find a just-right Chase wire. It comes in six standard annealed and eight standard drawn tempers.

But no matter which Chase wire is used, you can be sure that it will have accurate dimensions, true roundness, freedom from physical defects, beautiful uniformity of surface, texture and color.

Write for *FREE* booklet—"Chase Cold Heading Extruded Brass and Copper Alloy Wire" giving physical and fabrication properties, applications, weights per 1000 feet and feet per lb.

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(FIBERGLAS-CENTERED)

NEW! REVOLUTIONARY!

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- **Greater uniformity**
- **More flexibility**
- **Wide range of tensile strengths without any change in bulk**

These remarkable fillers with a Fiberglas core were developed by Twitchell with the help of Owens-Corning. Textilene FC Fillers have been approved for portable cords and are now used by many large manufacturers. Talk to Twitchell about its specially developed fillers for non-metallic, shipboard, underground and varnished cambric cables, and wire rope.

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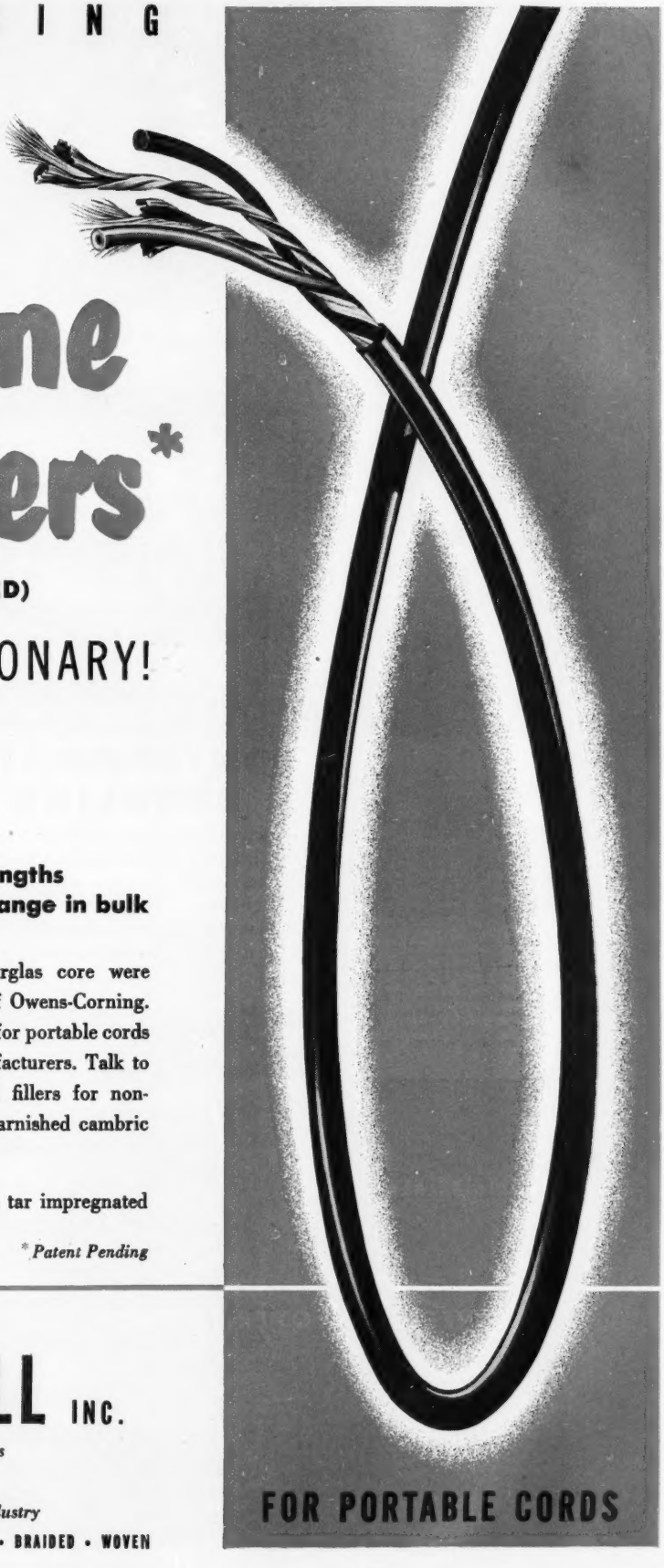
* *Patent Pending*



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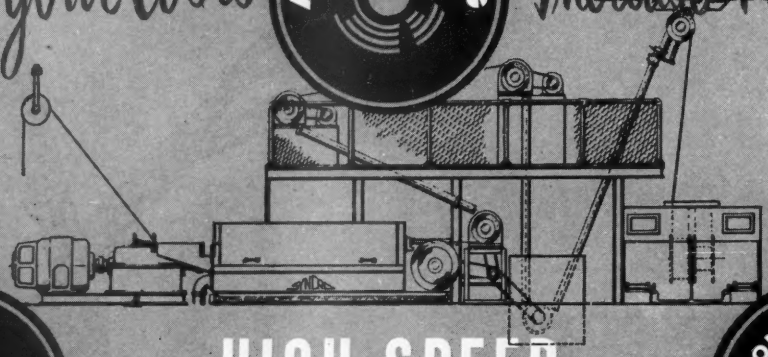

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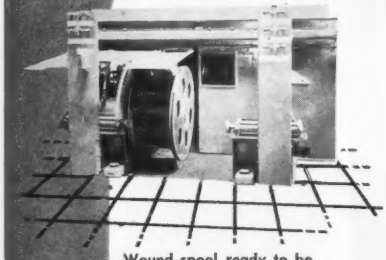
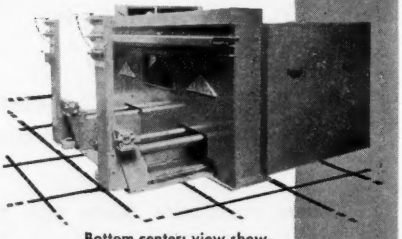
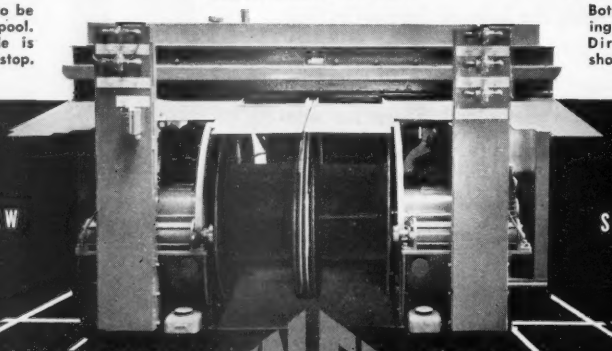


Wound spool ready to be replaced with empty spool. Another spool inside is still spooling without stop.



Bottom center: view showing spool arrangement. Directly above: view shown during operation.



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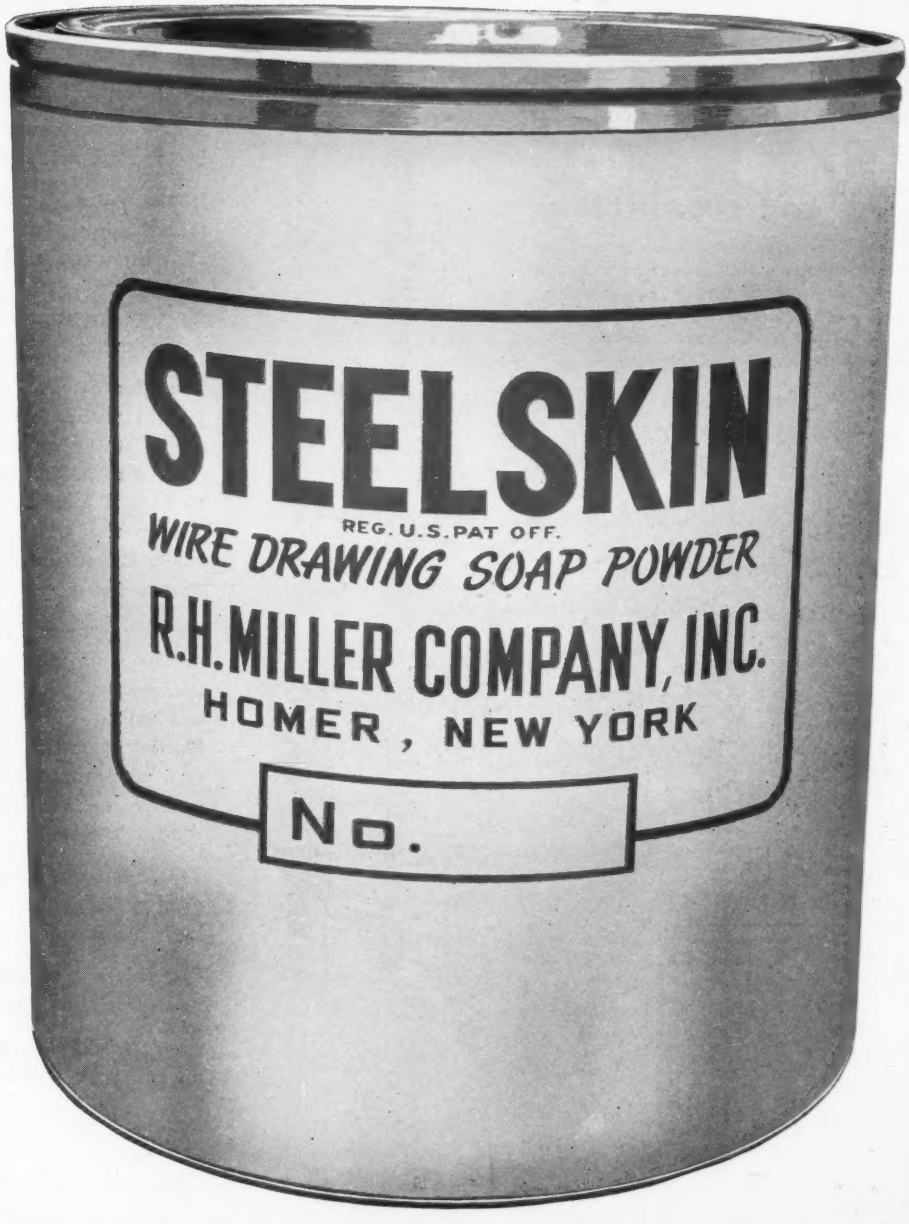

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THE MANUFACTURERS ASSOCIATION OF CONNECTICUT, INC.
Awards this CERTIFICATE of APPRECIATION to
The Hartley Tool & Die Co.
Established in Connecticut 1850
In Witness Whereof these presents have been signed, sealed and delivered by The Manufacturers Association of Connecticut, Inc., This twelfth day of September, A.D. One Thousand Nine Hundred and Fifty
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It is small wonder, then, that Hartley's Tungsten Carbide Dies have attained a degree of excellence that spells savings for you in your wire drawing operations.

The Hartley Tool & Die Compan is proud to reproduce the certificate recently awarded to it by the Manufacturers Association of Connecticut for their long period of successful service to its community, the state and to industry.

Long-experience and ingenuity in the manufacture of wire drawing dies and other standard carbide products has made Hartley Dies both lower in first cost and more economical in wire, tube, heading and other production costs.

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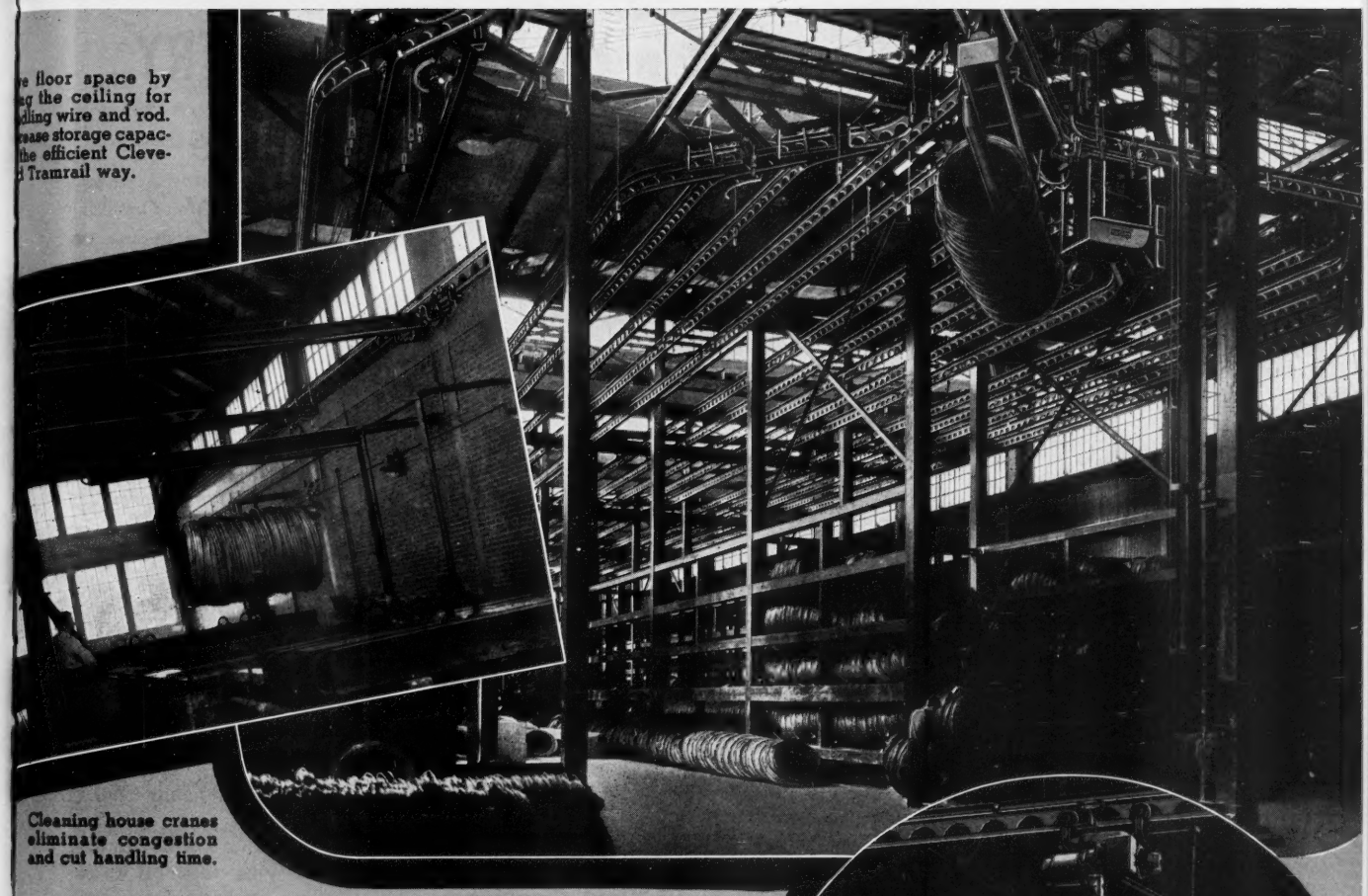

Cleaning house cranes eliminate congestion and cut handling time.

In these days when greater and greater production is called for in mills and plants drawing and fabricating wire and rod, Cleveland Tramrail offers a real solution.

Without plant expansion or new building construction your production can be greatly stepped up by modern Cleveland Tramrail methods. Equipment is available for every department.

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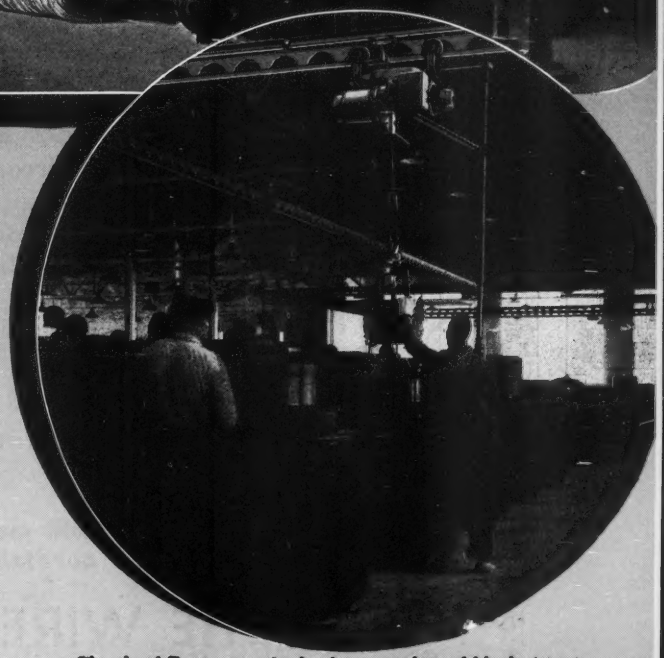

Cleveland Tramrail is the leading supplier of block-stripping crane and carriers for both internal and external stripping.

CLEVELAND TRAMRAIL

A SPECIAL MESSAGE
to
NON-FERROUS MEN in the WIRE INDUSTRY

In October—the 22nd to the 25th—the Program Committee has set up an exceptionally fine series of technical papers for you. We want to see all men concerned with this branch of our industry at this important Convention—now is the time to make arrangements with your company to attend these sessions.

Papers will be given on the following subjects:

Catalytic Combustion of Wire Enameling Fumes.

Saturants and Finishes for Electric Wire and Cable.

Cellulostic Coatings for Braided Insulated Wire.

Signal Corps Production Requirements.

Preparation of Dry-Blend PVG Compounds for Extrusion.

Process Control for Enameling Copper Magnet Wire.

The New Rigid Vinyl Coatings.

The Current Aluminum Situation.

The Manufacture of WDI Wire.

High Strength Copper-Silver, Copper-Iron and Copper-Iron-Chromium Wire.

The full program will be printed in the August issue of Wire and Wire Products with authors and other program details—and with the complete list of ferrous papers.

The Convention will meet at the LaSalle Hotel, Chicago
All wire men are cordially invited to attend these sessions.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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Introducing "Formbrite"

Specially processed copper alloys with a money-saving grain structure

Formbrite is a metallurgical development of The American Brass Company applied to copper alloys, particularly brass. A special rolling or drawing process plus a special heat treatment impart a superfine grain structure to the metal.

Because of its fine grain and hard surface, substantial economies can be effected in polishing and finishing. Usually only a simple color buff is required before plating.

As a drawing brass in the form of sheet or strip, Formbrite is stronger, harder and more resistant to scratching and abrasion—yet so ductile that it readily withstands deep-drawing operations.

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Formbrite is beyond the experimental stage. Millions of pounds have been made, sold and satisfactorily fabricated and finished. It costs no more than standard drawing or cold heading brass. If you are cold-working brass in the form of sheet, strip or wire, you will want to know more about Formbrite. Write for Publication B-39 . . . and if you'd like to compare Formbrite with ordinary drawing brass in your own polishing room, ask for the kit of two sample cups. The American Brass Company, General Offices, Waterbury 20, Conn.

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Formbrite is a trademark of The American Brass Company designating copper-base alloys of exceptionally fine grain, combining unusual polishing characteristics with good strength and hardness, plus excellent ductility.

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Why Don't You, IF YOU HAVE NOT YET WRITTEN A TECHNICAL ARTICLE FOR WIRE AND WIRE PRODUCTS, TRY YOUR HAND AT IT?

Every time you read an article that is particularly helpful to you, it is good to bear in mind that the author gave of his time and experience—and of his company's fund of information—in order that you might benefit.

This generous sharing of our knowledge advances the science of wire and wire product manufacture and places upon beneficiaries a reciprocal obligation to do their bit to contribute to the general welfare of our industry. In this giving you acquire added stature. Articles on wire processing, wire product fabrication, electric wire and cable manufacture or on any of the products or equipment used in making the products, are all useful to others.

You, our readers, are therefore cordially invited to prepare technical papers for publication in WIRE AND WIRE PRODUCTS. We will welcome your cooperation.

THE MEDAL AWARD

If you are a member of THE WIRE ASSOCIATION, as you should be, your technical papers will be considered for the annual MEDAL AWARD, a Tiffany bronze placque that is given to contributors for the best papers of the year by the Board of Directors of the Wire Association, which body constitutes the Committee of Awards.

However, the submission of papers for publication is not contingent upon membership and the invitation is extended to anyone in the field who will extend his help.

Please write us regarding your willingness to contribute to WIRE AND WIRE PRODUCTS, giving the proposed title of your paper and the approximate date on which we may expect to receive it. You will be helping yourself, your company and others engaged in similar work. Address your letters to

EDMOND D. SICKELS, Editor

WIRE AND WIRE PRODUCTS

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design engineers know...

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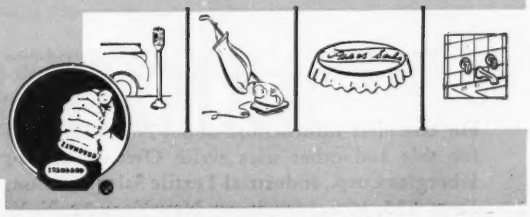

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why tapes unidirectionally reinforced with FIBERGLAS *Yarns* are used for CONTROL CABLE assembly binding?

FIBERGLAS* *Yarns*

Along with the entire electrical industry, Owens-Corning Fiberglas Corporation is faced with increasing civilian and military demands. While we cannot now supply all the materials our customers want, we are substantially increasing our production facilities. Therefore, we believe it to your future best interests to consider this new and recommended use of Fiberglas yarns.

- WILL NOT BURN
- WILL NOT ROT
- WILL NOT ABSORB MOISTURE
- HAVE GREAT TENSILE STRENGTH
- MINIMUM SPACE FACTOR
- LOW COST!

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

For complete information about Fiberglas yarns for this and other uses write Owens-Corning Fiberglas Corp., Industrial Textile Sales Division, Dept. 875, 16 E. 56th Street, New York 22, N. Y.

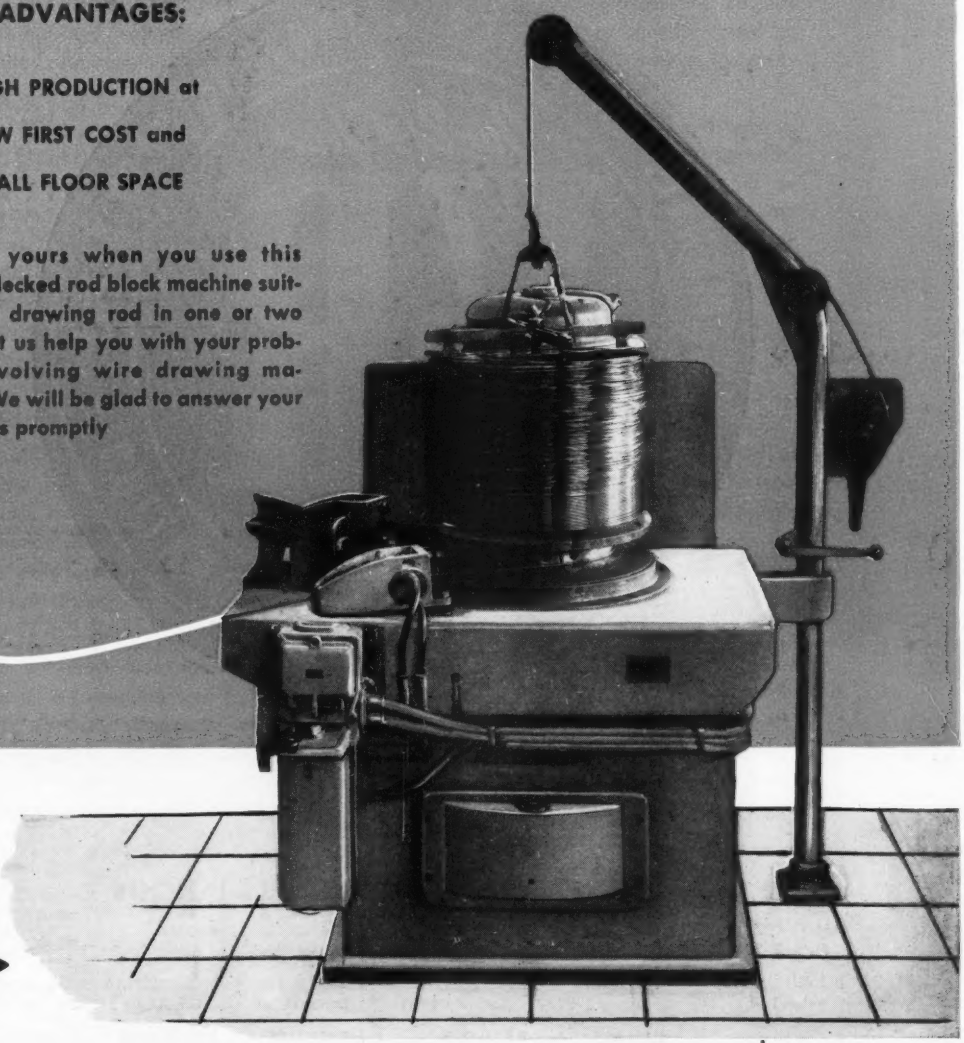
OWENS-CORNING FIBERGLAS *Yarns*

Wire drawing machines

THREE ADVANTAGES:

1 HIGH PRODUCTION at
2 LOW FIRST COST and
3 SMALL FLOOR SPACE

will be yours when you use this double-decked rod block machine suitable for drawing rod in one or two steps. Let us help you with your problems involving wire drawing machines. We will be glad to answer your questions promptly



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		KANSAS CITY Baltimore 1700	NEW YORK Flushing 3-0027	ST. LOUIS Newsted 3110	

The Wire Outlook

While steel mills are operating at record levels, the output is far short of demand because of the mounting defense load on the mills. The increase in ingot production is small comfort to wire men, since rod tonnage has not advanced in proportion. Greater hardships for wire users will probably not be felt until early 1952, however, by which time only 70% of the steel available in the first half of 1950 is expected to be available for general uses.

On July first the "DO" order system, which has been found inadequate for the expanding defense program, will be supplanted by the "CMP" system, modeled on the materials control plan used in World War II. Under the new arrangement, controls involving steel, copper and aluminum will be allotted every three months based on detailed requirements submitted in advance for production bearing directly or indirectly on defense work and "essential" civilian needs.

As 1952 progresses there should develop some relief for our metal-starved mills as new production facilities for all three of these basic metals come into operation. No one can foresee exactly what conditions may be, as long as the threat of an all-out war hangs over the world. Mills will be busy in any event, the civilian consumer getting the short end of whatever is made. Copper is now cut back 65% for civilian needs. Stainless steel may be 70% short of such demand next year. Resistance wire is likely to suffer most, as defense uses are expected to take 80% of the supply.

In a recent statement, C. M. White, President of Republic Steel, expressed the opinion that the present wage and price control bill had been in operation long enough to convince nearly everyone that it wouldn't work, since it neither had halted nor could halt advances, because it sought "to cure the result and not the cause". This bill is costing taxpayers 300 millions a year to enforce and is syphoning out of private employment thousands of persons into an already fantastically large Federal payroll. Mr. White suggests the practical expedient of reducing the available supply of money and credit, increasing at the same time the supply of goods. He points out that while our production has doubled since 1939, the amount of money in circulation has tripled.

Scrap is again a problem. The NPA is now setting up machinery for a country-wide drive to effect local collections of this important material. Since electric furnace capacity is something over 7,500,000 tons annually and its material is practically 100% scrap, capacity production could put a dangerous strain on the available supply. One authority states that the difference in a short supply of scrap and an apparent plentiful supply has never exceeded 5%. This points to the wisdom of every metal user conserving and returning his scrap promptly to sources that can utilize it.

The demand for fencing has lessened in some quarters and nail supply is said to be slightly easier. Manufacturers' wire, however, is far behind the needs of product fabricators. Alloy wire orders are coming in much faster than can be handled. Wire rope is in greater demand with delivery dates lengthening. Defense wire volume has increased slightly, but is far below that of most other forms of steel. Inadequate rod supply is behind all wire shortages. Motor car production has held up far beyond anticipation, even though this may not continue through the year. Add to this the production of vehicles and planes for war uses, and it is understandable that spring wire, control cables and electric wiring volume for this trade has not abated.

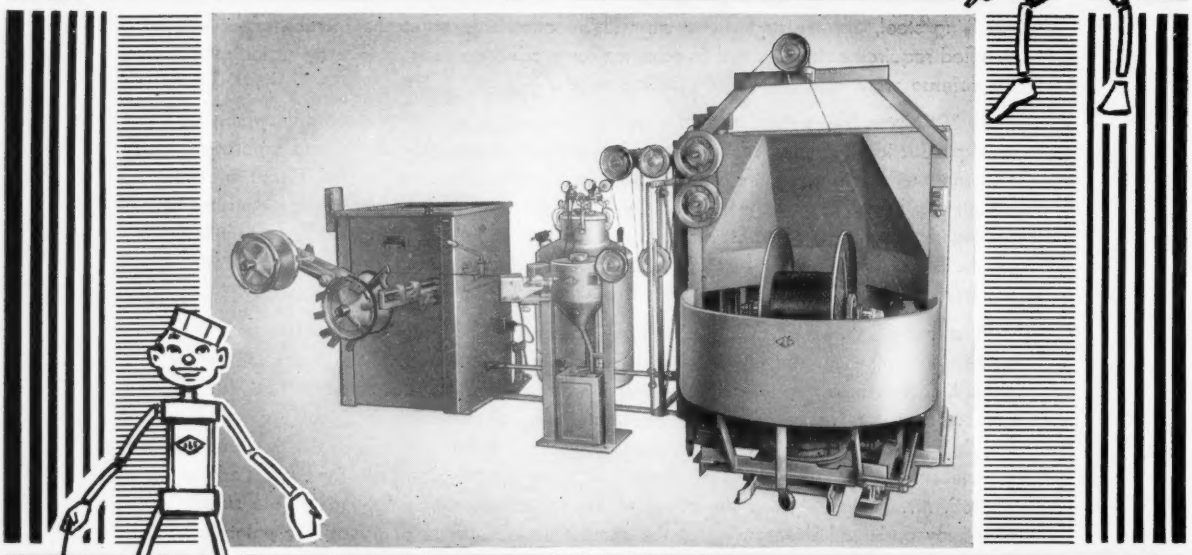
While there are some signs of business uneasiness, induced by materials shortages, the country's overall business activity is steadily rising, sparked primarily by increased military buying.

—from the Editor's Desk

THE IMPROVED AUTOMATIC COILER

CLASS - A TYPE ACW

FOR COILING SIGNAL CORPS
★ WIRE WD-1/TT AND WD-14/TT INTO ★
AN MX-306 A/G WIRE DISPENSER



CHECK THESE OUTSTANDING FEATURES!

- Pay-off unit will accommodate 30" diameter pay-off reels. This means up to 18 wire dispensers per pay-off reel.
- Pay-off reel remains stationary on its vertical axis.
- Coiler operates at a constant speed and tension during the entire winding of the coil.
- Adhesive is sprayed on wire in enclosed chamber. Excess is collected.
- Double-head construction of take-up unit allows operator to start new coil before removing finished coil and to assemble a new collapsible reel while other coil is winding.
- Dispenser side plates are in position during winding of coil and remain as part of dispenser during taping and drying period.
- Adhesive sprays are automatically controlled. Coil decelerates and stops at a predetermined footage.
- Machine can be installed on any rigid floor without pit.

(See Page 505 for a complete listing of JLE products for the insulated and bare wire industries)

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 26 JUNE, 1951 No. 6

THE CANADIAN REGIONAL MEETING

The history of the Wire Association was further enriched on April 19th and 20th in Hamilton, Ontario by another splendid Canadian Regional Meeting.

★ ★ ★

Under the able Chairmanship of **James W. Galloway** of the **B. Greening Wire Company, Ltd.**, the members and guests of the Wire Association attending were able to enjoy and profit from a program that embodied fine technical papers, an interesting plant inspection and a memorable banquet.

★ ★ ★

196 persons registered for the meeting and 220 attended the banquet, to which the ladies who came to Hamilton with their husbands lent their gracious presence. It should be noted that special arrangements had been made for the entertainment of the ladies during the business sessions, including a luncheon for them at the Tamahaac Club as guests of the B. Greening Wire Company and a sight-seeing drive around Hamilton later in the afternoon.

★ ★ ★

The afternoon of the 19th was devoted to a plant inspection trip to the mills of the **B. Greening Wire Company,** which impressed the visitors favorably in that equipment, plant layout and the versatility of operations were all considered excellent. Besides a modern wire mill, the company manufactures wire rope, screen cloth, heavy screens for mines and quarries, poultry netting and a variety of other products. The company also maintains a well equipped machine shop for the upkeep and repair of production machinery. The plant visit was in charge of **R. H. Rutherford** of the company, whose arrangements for handling the tour of the mills were most efficient.

★ ★ ★

The meeting's success, Mr. Galloway stated, was the result of the close cooperation of the committee members. Special credit is due to **L. Atkinson** of **Frost Steel and Wire Company,** Hamilton for the excellent job in handling hotel arrangements; to **R. S. Hull, Canadian General Electric Company,** Peterborough, for a program of technical papers that elicited much favorable comment; to **G. R. Jones, Canada Wire and Cable Company,** Leaside, whose handling of publicity resulted in so fine an attendance; to **R. F. Wilson, Donald Ropes and Wire Cloth,** Hamilton, who served as treasurer; and to **E. V. Larson,** the **Larson Company,** Toronto, who acted as secretary for the Program Committee.

James W. Galloway, Plant Engr., B. Greening Wire Co., Ltd., Hamilton, Ont., Canada

★ ★ ★

In the evening of the first day, after an enjoyable cocktail hour, the Association banquet got under way at 7 p. m. Mr. Galloway, following the dinner, made the opening address of welcome, introducing **Fred M. Crapo,** President of the Wire Association. Mr. Crapo remarked on the fine turnout for the meeting and extended his congratulations to the members of the Program Committee for their splendid work.

★ ★ ★

He traced the history of the founding of WIRE AND WIRE PRODUCTS twenty-six years ago and of Richard E. Brown's purchase of the

(*Please turn to page* 520)

INSULATED CONDUCTORS in CANADA

by J. P. Watts, Division Engineer
Wire and Cable Division
Canadian General Electric Co., Ltd.,
Petersborough, Ont., Canada

Mr. Watts has traced the development of the electric wire and cable industry in Canada in this paper that he presented before the April Session of the Canadian Regional Meeting of the Wire Association in Hamilton.

(**A Paper** for Wire Association meeting in Hamilton April 19-20, 1951).

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This paper is not technical in nature since a technical paper on insulated conductors could not be expected to be of interest to a group composed of both ferrous and non-ferrous interests. With this thought in mind technical data is held as much in the background as possible and emphasis placed on the historical aspects of the subject. It is true that some references are made to equipment and processes all too familiar to the non-ferrous group and strange to the ferrous group. However it is hoped that the context will be sufficiently clear to provide interest to all.

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Kensington Museum shows a piece of wire said to have been made by the Ninevites about eight hundred years before Christ and Homer mentions a similar product made of beaten metal cut into strips and hammered together. Wire Drawing does not seem to have been practiced much before the fourteenth century and not introduced into England until the seventeenth century. All this was before the concept of our industry in Canada but was after all our faint beginning.

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When the Electrical Industry first started in Canada in the late 1800's there were no Wire and Cable Companies. The manufacture of insulated wire happened to be an undesireable but rather necessary step in the fabrication of coils or motor windings and so naturally to make electrical apparatus one had first to make insulated wire. Looking at this from a Wire man's point of view, in the early days we not only made wire but wound coils, assembled motors and generators, built street cars, and ran the transmission lines for lighting and power. It is seen, of course, that eventually the wire end of the business grew large enough to be all the problem we wanted and we had to turn the apparatus portion loose to shift for itself.

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Picture 1887 in Canada. Horse drawn street cars and drays used our unpaved streets. Men wore mustaches and small brown bowler hats. Women's dresses were high waisted and reached the floor. Bobbed hair was unknown and picture hats and ostrich plumes were the vogue. In 1887, the first electric street car was operated between Thorold and St. Catharines.

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Also 1887 saw the birth of insulated conductors in Canada. The factory did not employ more than one hundred men, women and children not half of whom actually made wire and cable. These people worked a six day week ten hour day for wages down to five cents per hour and the organization was not elaborate. The superintendent or foreman in those days purchased his own material, wrote his own specifications, calculated his own costs, handled his own industrial relations, and to some extent did his own selling!

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All of the drawn copper conductor was imported. Most of the larger copper sections were brought in from the United States and a large portion of the finer copper imported from England. The range and diversity of sizes was not large to match the restricted range of product manufactured. The product itself ranged from magnet wire through weatherproof wire, rubber cords and underground cable.

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The early magnet wires were pure silk insulated or cotton insulated manufactured on equipment nearly identical to that in use today. Pretty well all the magnet wire manufactured was consumed on the premises to fabricate coils and motor windings since no outlet existed for commercial sales.

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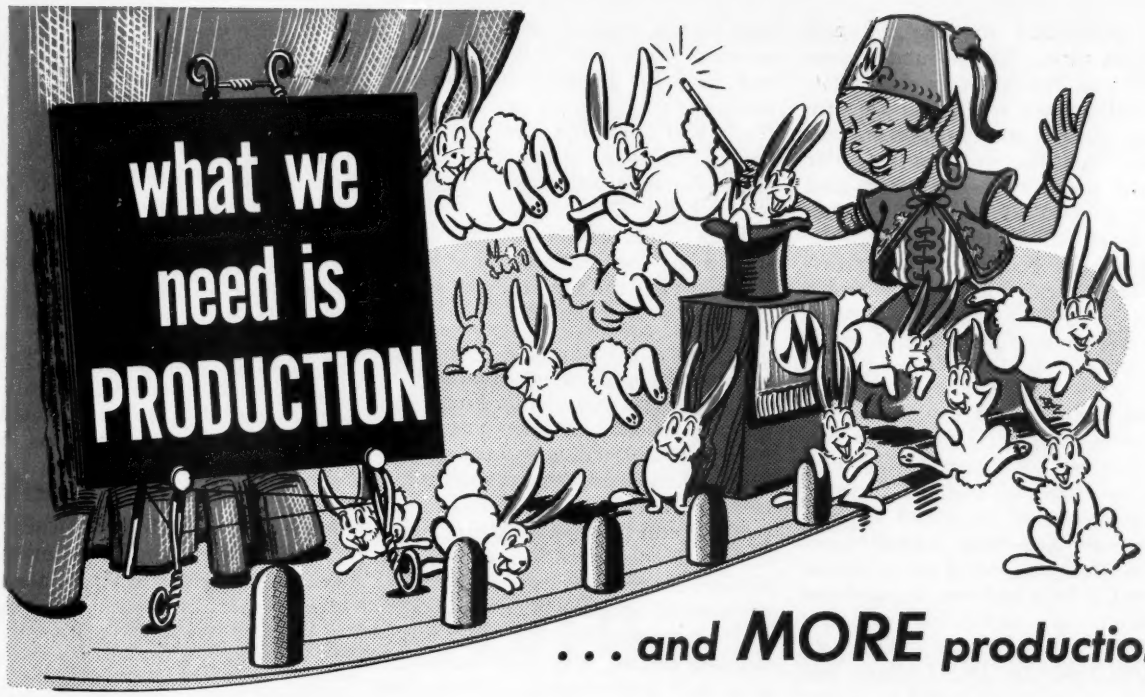
Weatherproof wire for overhead distribution was braided of cotton just as it is today but made using double deck Butt braiders. This type of equipment although still in use because of the high quality of braid possible is not now so popular due to the slower production speeds. These cotton braids were treated with asphaltic type compounds as a preservative measure but these compounds were not too successful. Prolonged exposure to weather and sunlight caused dryness and rotting of the braid to occur and eventually the covering "festooned" and you are all probably familiar with this unsightly and useless condition. This is the feature which lead to the work done by the Utilities Research Commission in 1932 and the standardization on URC finishes which are in general use today.

★ ★ ★

Rubber insulated cords of early manufacture were not of high enough quality to stand the test of time and have disappeared completely from the market. The conductors were simple bunch strand made by drawing the strands of copper directly into a cotton wrapping machine without twist. The cotton wrapped conductor was insulated by wrapping with a vulcanized elastic



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strip purchased in England and glued in place. This insulated conductor was braided with glazed cotton and twisted into pairs to form the completed cord. One green conductor and one yellow conductor twisted formed one standard cord and one red conductor and one yellow conductor twisted formed the other standard cord. The Deluxe effort called the "Harlequin" was a green and yellow conductor twisted with a red and yellow conductor!

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The underground cable made in 1887 was the old Edison Tube System. Copper rods were bound with manilla rope and inserted three at a time into steel pipe and impregnated in place with asphalt compound. The cable could not of course be readily bent and was shipped and installed in individual lengths. These were used fairly extensively in 1888-1892 for DC systems but the use of AC had started to gather momentum in 1886 and transmission voltages had started to rise so that this original underground system of cable became inadequate and was discarded.

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In 1890 the first leaded cables were manufactured in Canada. These were cotton insulated conductors, colour coded and assembled in sequence suitable for telephone circuits and then lead sheathed. Some of these were installed underground so constituted the first underground telephone cables in Canada. It should be remembered that only 14 years prior to this in 1876 Alexander Graham Bell made his first historic phone call from Bratford to Paris. It should be remembered too that commercial lead sheathing was not being done at all either in Europe or U.S.A. until 1879 or 1880 and not until 1890-1891 was paper insulated lead sheathed cable to start into general use in England.

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In 1892 the first rubber extruders for wire insulation were operated in Canada. These produced "white core" core on a double extrusion basis. The first layer was extruded white and the second layer black and the wire so insulated was vulcanized in pans while embedded in powdered soapstone. This material was cotton braided and the braid finished with asphaltic compound and used for building-wire on the knob-and-tube wiring system. John Royle and Sons sold their first rubber extruder in 1880 and the first Royle machine was used to insulate wire in the U.S.A. about 1890 so Canada was not far behind! It should be remembered that 1892 was the year the first electric street car ran in Toronto.

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However, rubber extrusion was not in general use at this time. The English practice of strip insulating was still the common practice and was to remain in use for nearly fifteen years. Rubber compounding was done on the open mill-mix principle and calendered into sheets and slit into strips. The strips were folded around the wire longitudinally and the seam rolled together in machines handling originally six heads at a time later expanded to twelve heads. This wire was run into a bed of soapstone in pans and batch vulcanized then cotton braided and compounded like the "white core" wire and used for the same purpose. These machines handled also the cord insulation which was now vulcanized in position instead of using the pre-vulcanized elastic strip mentioned previously.

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1894 was the year copper wire was first drawn in Canada. The hot-rolled rod used for breakdown was brought in from the U. S. and although operations were not extensive growth was rapid from this date onward.

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In 1900, therefore, all the basic operations of the Insulated Conductor business were established in Canada. Copper wire was being drawn in our own mills, stranding was well established, cotton wrapping magnet wire and cords was an old story, mill-mix rubber compounding was fairly well understood, strip rubber insulating and rubber extrusion were both being practised, cotton braiding and compounding was a well known art and lead sheath extrusion was established. In the electrical development of Canada this was still in the days of the Edison Bi-polars and it took four weeks to wind one armature of the old ball type motors. Factories were working a 5½ day week 10 hour day paying women 8 cts per hour and men 10 cts per hour.

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In 1900 there were three Wire and Cable Companies in Canada. Together they probably did not employ more than 400 people and unfortunately no statistics are available regarding the volume of material they produced. We do know, however, that copper was worth 17 cents per pound and cotton 18 cents per pound. Weatherproof wire at this time cost just less than half the present costs for the same size. This does of course, show progress since the finished wire costs have by no means risen as fast as the material and labour costs over the same 50 year period.

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The early 1900's saw considerable activity in the Canadian Wire and Cable scene. Volume of material produced was of course expanding. Rubber extrusion came into its own and displaced the strip insulating method. Most factories were formulating and mixing their own rubber compounds, impregnated paper insulated power cables were a production item and most factories were drawing their own copper. By 1920 the number of companies making insulated wire had doubled and the first mill for hot-rolling, copper rod from billets was nearing completion and would be operating by 1922. The Dominion Bureau of Statistics now recognized that the industry was a separate entity and for the first time recorded the dollar volume sales as an industry item. This amounted to 14 million dollars for the whole Canadian industry in 1920.

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It should be remembered that in 1920 in the Toronto area it was possible to purchase property and erect a two story dwelling on it complete for $4800.00. It was possible to purchase this house with a down-payment of $300.00 and a monthly payment of $30.00. Insurance and taxes were covered by a monthly payment of $5.00.

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During the next ten years of activity and expansion no basically new processes were introduced but continued strides were made in re-

finement of process and volume of production. By 1929 the Dominion Bureau of Statistics show the industry operated at a yearly volume of 25 million dollars. Business then suffered a slight decline or depression.

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Prior to 1930 all rubber covered wires in Canada were extruded and vulcanized as separate operations. Some types were extruded into doughnut shaped pans into a bed of soapstone or talc to support the soft unvulcanized rubber, some were extruded onto large diameter smooth steel drums, some were taped during extrusion to protect the insulation and some were covered with a lead sheath mould. All of these systems were designed to prevent deformation and damage to the insulated but uncured conductor until the vulcanization operation was performed. All of these systems had some disadvantages in either quality, cost or volume. These are the reasons why simultaneous extrusion and vulcanization is of such interest to the Insulated Conductor people and in 1930 in spite of the depression the first continuous cure machine was installed in Canada.

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In the depression years in common with all industry effort was concentrated on more efficient methods, more efficient machines and improved materials. Work was continued and intensified in the Research Laboratories on synthetic rubbers and synthetic rubber substitutes having in mind materials to withstand heat, oil, sunlight and other special conditions which natural rubber did not successfully resist. It was during this period that interest in the synthetic rubbers such as Neoprene and the synthetic rubber substitutes such as Polyvinyl Chloride became acute.

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In 1938 the first plastic extruder came into operation in Canada. In spite of the fact that the polyvinyl chlorides and polyvinyl chloride acetates were expensive they found a place for specialty wiring where oil resistance and very high dielectric were necessary and where natural rubber compounds could not stand the service. This development was to be a distinct boon to the industry and to the Nation four years later.

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It may be of interest to pause at this time and look at this Wire and Cable child in 1938 the "Normal" peacetime year. You will recall that earlier in the paper it was mentioned that we had to abandon the unimportant units of manufacture of the electrical industry to shift for themselves. In 1938 the Canadian Electrical Manufacturing Industry in order of gross volume was split as follows:—

Wire and Cable	**14.7%**
Appliances and Parts	**14.4%**
Radio Apparatus & Parts	**11.7%**
Batteries and parts	**6.9%**
Total all others	**52.3%**
	100.0%

During 1938 the industry had climbed from the depression low (5 million dollars in 1933) back to nearly 15 million and was on the way to the 25 million dollar mark again and was to reach it in 1940.

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Another development born in the laboratories in the depression years took a little longer to reach the production machines but has grown steadily ever since. This is synthetic wire enamel of the polyvinyl acetal type. This material was first manufactured in Canada in 1939 but to-

(*Please turn to page* 517)

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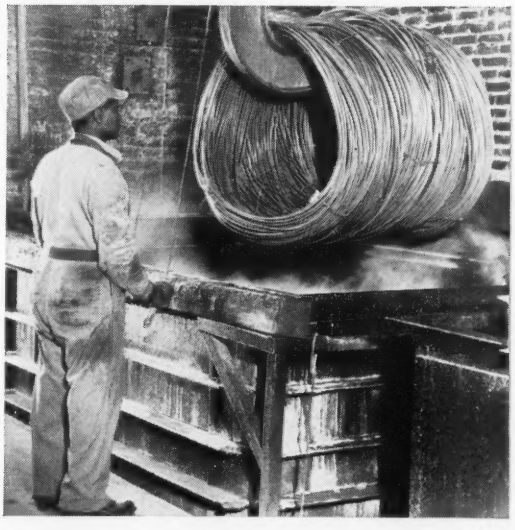

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SOME DEVELOPMENTS in NYLON and POLYETHYLENE WIRE EXTRUSION

By C. A. Litzler, President
Industrial Ovens, Incorporated
Cleveland, Ohio

This paper was delivered before the Canadian Regional Meeting in Hamilton. It covers the manufacturing processes and the latest development in the manufacture of field wire, using nylon and polyethylene extruded coatings. Those who heard it considered it an excellent and informative treatise.

One of the significant developments in the use of nylon and polyethylene as wire insulating materials is the combination of these two insulating materials in conjunction with an unusually high strength electrical conductor that has been recently developed by the Army Signal Corps. This wire, which is now being produced by industry in considerable quantities has been given some very severe battlefield tests in the present conflict. The results so far experienced are exceptional.

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In fact, the wire that has been developed, known as WD-1 Assault Wire, is a very lightweight combined with assembly which weighs 46 lbs. per mile and which has an effective talking range of 12½ miles. The extreme lightness of the conductor is especially suited to airborne operations or jeep or combat vehicle laying over rough terrain without serious damage to the nylon outer jacketing and thereby to the wire itself.

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Its talking range of 12½ miles allows it to be laid in suitably long lengths for effective communications even with rapid troop movements. The effective range also shows excellent electrical properties.

Cable Construction

In construction, the complete Assault Wire is a two-conductor, twisted pair cable. Each of the two individual conductors are constructed of a total of seven total strands of copper and steel wire, approximately 24 gauge.

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The steel conductors, of which there are three in the assembly of each conductor, are zinc-coated strands of a diameter of approximately .011″.

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The copper elements, of which there are four in each conductor, are tinned copper wire also approximately 24 gauge.

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These seven elements, after zincing and tinning, are stranded up in final assembly in a left-hand 1″ lay.

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After stranding, each individual twisted strand of four copper and three steel wires are insulated, by the extrusion method, with a polyethylene jacket which must be a heat-stabilized, non-oxidizing type of polyethylene. The insulation thickness is 14 mils and the insulation adherence to a strand must be such that the insulation can be readily stripped by hand with a pair of pliers.

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Over the polyethylene jacket is additionally extruded a final jacket of heat-stabilized, non-oxidizing nylon to provide a smooth, continuous and abrasion resisting nylon jacketing. The average overall thickness of the jacket is 6 mils and at no point in any continuous length of wire is the jacket thickness to be thinner than 4 mils.

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In total buildup, overall insulation and jacketing, the final diameter of the individual conductor is approximately .090″.

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After final nylon jacketing, two of the individual conductors are finish paired and are twisted together with a right hand lay to a uniform pitch of no greater than six inches.

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In final pairing, it is essential that each of the wires be let off in the strander at a uniform unwinding tension so that there are no gathering or twisting strains developed in the strand. This is especially critical because of the fact that one of the main requirements for this particular type of wire is that it unwind uniformly from the carrier spools and that having been unwound, it must lie flat on the floor or ground. Positive lie-flat specifications cover this phase of the wire's specifications and uniform unwinding stranding tension is a very important processing requirement.

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This particular wire construction produces an extremely strong, small diameter conductor with relatively low electrical resistance and with an extremely tough outer jacket. All of these characteristics are provided within the weight of approximately 46 lbs. per mile. This is exceptionally good cable construction.

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A typical flow sheet of the entire manufacturing process of this wire, broken down into its major components, would consist of the following elements:

1) **Tinning of the copper conductor.**
2) **Galvanizing of the steel strand.**
3) **Combined stranding and twisting.**
4) **Polyethylene insulation extrusion.**
5) **Nylon jacket extrusion.**
6) **Final twinning or pairing.**
7) **Final packaging.**

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In a review of the general breakdown of these processes, it readily becomes apparent that the insulating operation consists of applying the original polyethylene material to a bare conductor and the application of a nylon jacket to the polyethylene insulation. Because of the

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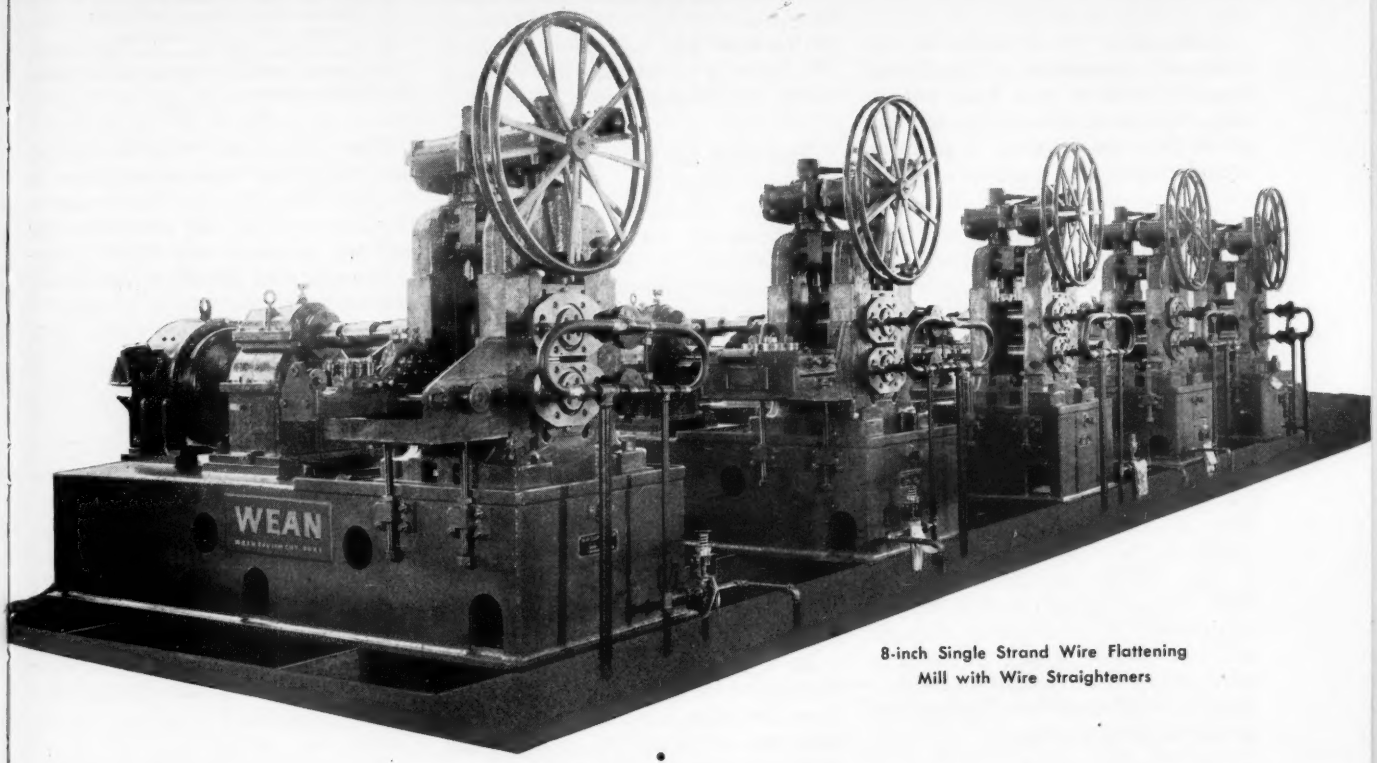

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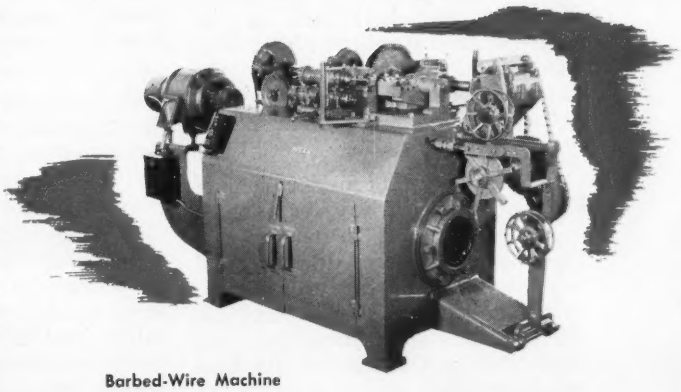
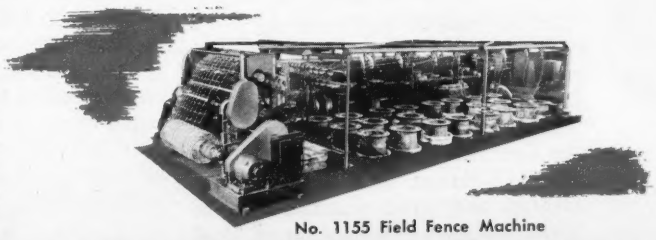


Barbed-Wire Machine



No. 1155 Field Fence Machine

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accuracy of the wire processing methods required in the jacketing operations, this paper will deal exclusively with the extrusion insulation and jacketing of this type and similar type cables.

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Inasmuch as the wire that is currently being required by the Armed Forces is used in very large quantities, high production capacity per production machine is a practical consideration and requirement.

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Because of the stringent specification on the gauge of the conductor and the thickness of the extruded insulation and jacketing, proper attention must be paid to the wire drive and handling system used to propel the wire through the extrusion operation.

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The specifications that must be met on the "lie flat" test indicate that excellent stranding operating standards must be maintained and it is also highly important that the wire be run through and processing equipment at a constant, uniform and low rate of tension in order to prevent any area reduction or drawdown which might result from improper tension control.

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A complete review of the manufacturing operation leads to the very positive conclusion that constant tension, especially in the jacketing operation, is a very important equipment requirement.

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In the overall consideration of constant tension in any operation, it is important to consider tension as a longitudinal, uniform draw or pull in the wire as that wire is in motion or rest in its travel from an unwinding reel through its manufacturing processing and thence to its final winding reel.

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In the case of any accurate processing operations, control of the work velocity is important and fundamental. This is particularly true in an extrusion operation because of the direct effect of wire speed on the jacket thickness. Additionally, there is only one other characteristic of the moving wire besides speed. That characteristic is tension and it, likewise, must be brought into complete and accurate control to meet the rigid requirements of the end use specifications.

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In any wire handling system, the need for constant tension is in direct proportion to the breaking strength of the wire and the speed at which the wire is to be handled in any given processing system.

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The need for relatively high production speeds per machine in this operation, because of the relatively low breaking strength of the combined strand, constant tension is a requirement just as important as accurate temperatures at the die head.

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In consideration of the wire handling problem in the extrusion operation, the next slide indicates a complete extrusion system shown with its complete constant tension drive. This particular constant tension drive has proved very satisfactory and versatile for the production of the particular wire under discussion.

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In a complete extrusion line designed for both nylon and polyethylene extrusion, a number of unusual adjuncts are combined to allow for high wire production speeds, accurate extrusion jacketing control, constant tension handling and wide operating speed ranges.

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The tensions are controlled from the driven unwinding stand through the tuber die head to the capstan and directly through the windup machine. This system further handles large capacity supply reels which might be wound at un-uniform tensions and it will, under these conditions, develop an accurately coated wire which can be wound at a constant tension directly on the strander spools. By paying off into the extrusion system from draw-bench takeup reels and taking up the extruded wire on strander spools, there is no need for immediate rewinding to suit this operation. Sometimes, it is impossible to provide this reel arrangement but if at all possible, it should be done. Much work handling can be eliminated.

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Reading from right to left on the slide, the following elements are listed in their processing order:

1) Driven unwind stand.
2) Tension control stand for driven unwind.
3) Plastic insulating tuber.
4) Combination polyethylene and nylon cooling trough.
5) Double drum capstan.
6) Voltage breakdown indicator.
7) Tension stand for takeup.
8) Continuous takeup—constant tension.
9) Special variable voltage and hydraulic system drive.

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Like any other extrusion operation, the proper wire speed depends directly upon the insulation jacket thickness applied, the wire diameter and the extrusion machine's delivery capacity in pounds of insulating material per hour.

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Because the jacket thickness for polyethylene is two and one half times thicker than the nylon jacket, there is a proportionate difference in the rate of speed of the wire being insulated with these materials.

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Some experience indicates the wire speed on polyethylene can be increased so that the difference in processing speeds is not in proportion to the jacket thickness providing the tuber delivery remains the same.

Driven Letoff Stand & Tension Control Unit

The proper application of any jacketing insulating material, by the extrusion method, requires precise tension control and because low tensions are used in the processing of Assault Wire, a driven constant tension letoff stand has been incorporated into this system.

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The stand is driven by a synchronous electrical drive in such a manner that the wire is paid off from this driven reel at a rate of speed that is approximately synchronous with the capstan speed. Besides running at synchronous speed, the wire is driven at a constant tension. The tension on the wire is maintained at a constant rate by the use of the dancer sheaves which are either counterweight or air loaded with a given loading so, regardless of the velocity of the wire, the loading on the wire and, therefore, the tension will remain the same. The tension on the wire is applied directly to the wire in the

tension control stand. This tension is constantly applied through acceleration or deceleration or when the wire is at high speed or in a stopped position. Regardless of the speed of the wire or how the wire rate of speed may be altered through the complete speed range of the system, the unwind stand reel is always rotating at a constantly corrected synchronous speed and wire tension. The tension stand floating sheave is connected by a hydraulic or a no-slack transmitter directly to the operating lever of a variable speed drive transmision. As the lower dancer sheave falls, the falling movement is transmitted to the mechanical driving element to effect a slowing down of the transmission output speed. As the floating sheave rises, the reverse effect is true.

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This dancer synchronization operates through the mechanical drive system only and does not affect or is affected by the variable voltage electrical drive. More will be mentioned about the drive under the proper heading.

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Relative positions of the dancer sheave, above and below the original synchronous setting, corresponds to relative speeds of the unwinding reel. Through this automatic balanced synchronization, the reel is continuously running at a speed that is synchronous with the speed of the wire as determined by the capstan. It is rather difficult to measure accurately the tension in a moving wire. Tests in installations have indicated that the pull tensions of approximately ten pounds on the wire are the minimum that are run with large supply reels on the wire under discussion.

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It might be worthwhile to note that the tension stand is literally a measuring device which continuously measures the amount of wire that is being fed into it by the driven unwind stand and compares it to the amount of wire that is being taken out by the capstan. Inasmuch as the differences in the wire taken in and taken out reflect in the relative position of the dancer sheave, this relative positioning movement is used to control a servo-controlled transmission which, in turn, drives the unwind stand.

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Thus, the wire is paid from a driven unwinding reel and the wire itself is subject to no more than 10 pounds tension which is applied to the wire under positive control at the tension stand. The wire does not turn the reel, as in the case of the friction unwind stand, but merely is continuously tensioned and measured. The measurement is then used to control the output speed of the reel driving transmission.

The Polyethylene & Nylon Extrusion Machine

The general types of extrusion machines that are principally used in this operation are shown in the following slides.

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Both of these machines are typical plastic machines and both are equipped with crossfeed insulating heads with the regular nylon and/or polyethylene die system and screws.

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The conventional plastic insulating machines, such as are used for polyvinyl chloride extrusion, could conceivably be used for the application of nylon and polyethylene. However, machines specifically designed for the application of nylon and polyethylene would incorporate a somewhat different screw and die head along with extra thermal capacity in the electrical heating system. This is done, principally, to the fact that nylon extrusion temperatures run somewhat higher than conventional plastic. In the case of the nylons and polyethylenes, the die and die holder must, of necessity, be heated. Most wire producers use a separate die for nylon and one for polyethylene.

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The next slide gives an indication of a typical layout of a nylon tip and die. This drawing is a horizontal section taken through the centerline of the crosshead and the centerline of the wire.

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You will note that the end of the core tube is equipped with a vacuum line. The principal purpose of this vacuum line is to reduce the pressure around the wire and between the wire and the nylon tip to improve the polyethylene and nylon adhesion. Although the system may not necessarily be of use, it is recommended for the tighter jacketing of the nylon to the polyethylene.

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In actual practice, the same plastic insulating machine would be used for both materials but it is necessary to change the extrusion screw and the die head. Any of the tuber manufacturers have information available as to detailed information on the dies and screws for these two materials. At normal operating procedure, for a line of the type that has been indicated previously, a 2½" diameter screw machine would be used. Its normal delivery capacity would be in the order of 90 to 100 lbs. of polyethylene and slightly more pounds per hour delivery of nylon.

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If quite high production capacities are required and if the line is to be used at a later date for other types of material, a 3½" machine with a delivery of approximately 180 to 200 lbs. per hour would be an economical original installation.

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After being insulated in the insulating machine, the wire and the hot polyethylene and nylon jacketing pass directly into the horizontal cooling trough system.

★ ★ ★

The cooling trough itself is usually a square, triangular or a rounded bottom trough of sufficient length to provide for proper cooling of the nylon and the polyethylene jacket on the wire. The length of the trough depends entirely upon the wire speed, the insulation thickness and temperature. Depending upon these factors, the trough may extend from thirty to sixty feet.

★ ★ ★

Due to the speeds encountered in the nylon jacketing and due to the special zoning trough requirements for polyethylene, trough lengths of fifty feet in length are usually standard for this application.

★ ★ ★

In the running of polyethylene, correct processing requires that the wire be gradually cooled from its extrusion temperature through to a final temperature of approximately 100° before leaving the cooling trough. This is accomplished in a

trough by means of cooling zones which are supplied with heated water in varying temperatures as follows:—

1st Zone, after leaving tuber—160° F. to 180° F.
2nd Zone, after leaving tuber—140° F. to 160° F.
3rd Zone, after leaving tuber—120° F. to 140° F.
4th Zone, after leaving tuber—100° F. to 120° F.

★ ★ ★

This zone cooling is done in order to reduce the thermal shock on the polyethylene itself which would occur if normal cool tap water were first applied to the jacketing after leaving the tuber.

★ ★ ★

The zone cooling is accomplished by thermostatic control and on separate water heating and recirculating systems for each of the zones mentioned.

★ ★ ★

For the cooling of nylon coated wire, the cooling may be done with ordinary cool water applied to the wire as it has left the tuber die. In the initial spray of water on the nylon jacket, care must be exercised that the water pressure is not great enough to actually peal back or mark the nylon insulation in its hot and semi-fluid state.

★ ★ ★

There are several methods of applying the cooling water to the wire whether it be in the polyethylene zone cooling or in the room temperature cooling for nylon. The one type commonly used is the spray type which, as its name implies, is a continuous spray of cooling water from above the centerline of the wire.

★ ★ ★

A more advanced type of cooling is that in which the water is brought into the bottom of the trough and carried counterflow to the wire flow. The effect here is a carrying of the wire below the surface of the stream of water and, because of counterflow current, a high rate of cooling is obtained. Additionally, there is the lifting help of the water being applied to the wire from the bottom. This lifting help will prevent the wire from sagging in its passage from the die to the capstan and thereby minimizes the scraping of the wire on the bottom of the trough.

★ ★ ★

At the end of the conventional cooling trough, an air or felt wiper is used to remove the free water from the surface of the insulation.

The Wire Capstan

The propulsion of the wire in any extrusion system is accomplished by the wire propelling capstan.

★ ★ ★

The capstan shown in the slide is standard for this and similar jacketing operations. It is obvious that large diameter capstan sheaves should be employed to minimize the cold working of the wire or the breaking of the insulations at this point in their cooling.

★ ★ ★

The normal design factor used in determining the size of the capstan in a high speed wire handling system is twice the diameter of the barrel of the reel from which the bare wire is being unwound. However, in any case, the capstan diameter must be large enough to prevent breaking or cracking of the insulation material or cold working of the wire. This particular type of capstan employed a single drive on both capstan sheaves for minimum tractive effort on the wire or the cable.

★ ★ ★

Some telephone or power cable constructions, using paper or tape wrapped conductors, have critical bending radii. In cases where the radius is uncertain, a diameter of two and one half to three times the unwinding barrel diameter should be used to determine the capstan diameter.

★ ★ ★

The fact that the capstan, in any extrusion system, provides the main propelling force for the wire through the die head, the propulsion must be as smooth as possible. Engineering care must be taken in the design of the system driving the capstan so that jerkiness and speed variations are eliminated. In the machining of the capstan sheaves themselves, care must be used to be certain that the static and dynamic balance is assured at the maximum operating speed of the unit.

★ ★ ★

Jerkiness and unbalance at the capstan usually cause wire vibrations and pulsations which travel back along the moving wire to the die head. At this point, varying jacket thickness or concentric ridges in the jacket are formed. Obviously this wire will not pass final inspection.

★ ★ ★

The usual position of the capstan is directly at the end of the cooling trough as was indicated on a previous slide.

★ ★ ★

The Dual Continuous Takeup Machine and Its Tension Stand

As the extrusion speeds of both the nylon and the polyethylene are relatively high, continuous reel takeups are usually employed for final takeup. A conventional takeup, such as used in the production of this wire, is indicated in the next slide.

★ ★ ★

In the continuous running of these materials from a full to an empty reel at high operating speeds, it becomes apparent that the traverse and the guide sheave system must be adequately designed. The illustration indicates a compact arrangement of a double width traverse with a manual crossover guide.

★ ★ ★

The takeup machine should be arranged, if possible, to handle the same reels for final windup as would be used in the final stranding operation. This rather simple expedient saves the cost of rewinding the wire from the takeup reels to the strander reels.

★ ★ ★

The tension stand, which is shown adjacent to the takeup, accumulates the amount of wire that is not taken up after the crossover by the empty winding reel during the time it requires for full acceleration of that reel to a proper running speed.

★ ★ ★

The speeds of these wire lines run in the order of well over a thousand feet per minute; the acceleration time, although only a matter of seconds, requires the accumulation of a considerable number of feet of wire—this may amount to sixty or ninety feet of wire. This

(*Please turn to page* 511)

WIRE FOR FASTENERS

by S. W. McDermott
Works Manager, Swansea Works
Steel Company of Canada, Ltd.
Swansea, Ont., Canada

This fine treatise describes the kinds of wire the author has found best suited to cold heading work. It is one of a series of papers presented before the Canadian Regional Meeting of the Wire Association in Hamilton in April.

As the title implies, the purpose of this article is to discuss briefly wire for fasteners. I believe that you would be more interested in some details regarding one type of wire for fasteners than to generalize regarding a very broad subject. With this thought in mind, I am going to discuss Header Nut Wire and some of the difficulties that may arise in subsequent cold forming operations if sufficient care is not taken in its fabrication.

★ ★ ★

Header Nut Wire is used on Cold Nut Formers to automatically produce hexagon nut blanks which are subsequently tapped. Nuts ranging in size from ¼" light to 1" heavy and 1⅛" light are being made by this method.

★ ★ ★

A rimmed steel is desired for Header Nut Wire because the rimmed area is quite clean, homogeneous and ductile, and thus lends itself to the severe "upsetting" action of the cold nut forming machine. Surface finish is also easier to control in a rimmed steel of this type, and this is an important factor in Header Nut Wire.

★ ★ ★

Steel for Header Nut Wire is made in a 100-ton basic open hearth furnace, with a flush-off slag obtained by an initial ore charge. Sixty per cent of the metallic charge is molten pig iron with the balance being scrap. As you all know, the function of the open hearth is to remove by oxidation the 6 to 7 per cent metalloids present in the pig iron so that less than one per cent remains.

★ ★ ★

Header Nut Steel is made as a fully rimming steel to the following analysis:

Carbon, 0.08% max.; phosphorus, 0.03% max.; sulphur, 0.075/.10%; manganese, 0.50/0.60%.

The analysis is very similar to that of A.I.S.I. C-1106.

★ ★ ★

The main concern in producing a satisfactory steel for Header Nut Wire that will be capable of withstanding the severe compression and expansion to which it is subjected in the cold nut forming machine is to obtain a steel with a very sound and extensive rim zone. If it were not for the addition of sulphur to this grade of steel, it would be a relatively easy matter to obtain the desired rim. The sulphur is added to improve the machinability for the thread tapping operation.

★ ★ ★

Anything that will increase the iron oxide content of the steel will improve this rimming action since the amount of rim formed is entirely dependent upon the speed with which the reaction of iron oxide and carbon take place in the steel ingot as soon as it is poured. Since carbon is such a strong reducing agent it should be as low as possible, and conversely iron oxide should be as high as possible in order to allow the equation, $FeO+C \rightleftarrows Fe+CO$, to react to the right and deposit iron which constitutes the rim zone. This desired result is obtained in our open hearth by control of such factors as slag basicity, temperature, furnace oxidation and special additions.

★ ★ ★

Ingots are poured into 23" x 25" x 80" moulds, and the usual precautions to obtain a satisfactory surface are taken, such as proper open hearth pit practice, sufficient time for ingot solidification, soaking pit heating cycle, etc.

★ ★ ★

Ingots are rolled on a 14" Bloom Mill down to a bloom of approximately 10" x 10", and then reduced further in a 34" Bloom Mill to a 5½" Bloom. From here it goes directly into a continuous 18" Billet Mill where it is reduced in eight stands of alternate diamond and square passes into either 1¾", 2½", or 2¾" billets, dependent upon the finished size of rod to be produced. All billets weigh approximately 300 pounds, and all receive a thorough conditioning before further rolling in the finishing mills. This conditioning is extremely important in regard to surface finish in the rod and wire.

★ ★ ★

The 1¾" billets are rolled on our Rod Mill which is a two-strand Morgan Mill adapted for rolling four strands after the #6 stand. It is a 16-stand mill. Sizes of rod rolled for Header Nut Wire on this mill are 0.431", 0.500", and 0.531".

★ ★ ★

The 2½" and 2¾" billets are rolled on our 12/10" semi-continuous mill into various rod sizes including 0.562", 0.625", 0.656", and 0.734".

★ ★ ★

Every precaution is taken in the finishing mills regarding pass design, percentage breakdown, etc. The billets are broken down in both of these mills by the oval and square method. The material is coiled into coils weighing approximately 290 pounds.

★ ★ ★

During the processing from the open hearth through the various mills to the coiled rods, continual metallurgical checks are taken to ensure that the wire rods will be of satisfactory quality for further processing into Header Nut Wire.

★ ★ ★

The coils are then forwarded to the pickle house where they are

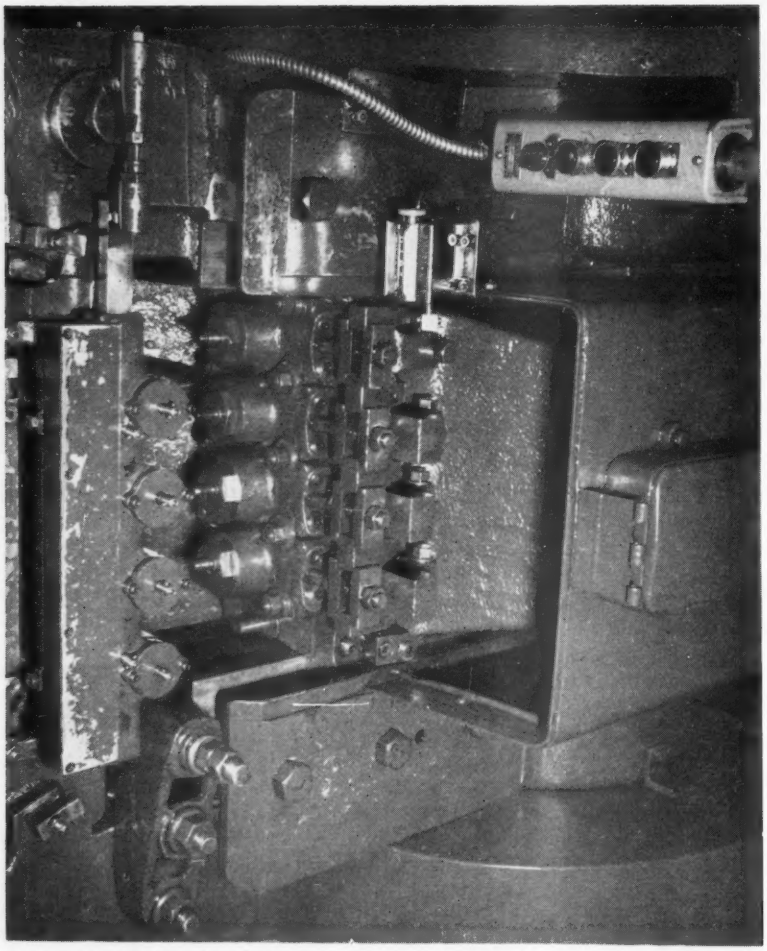


Fig. 1 — Looking down into the tooling set-up of a cold nut forming machine. * * * *

cleaned in an inhibited bath of sulphuric acid at a temperature between 150° F. and 180° F. to remove the scale. The time required is usually about twenty-five minutes after which they are given six dips in a bath of lime—8-10% concentration.

★ ★ ★

In drawing the wire the heavy lime coating, together with a suitable lubricant which in this case is Standard Chemical #83, produces an extruding finish necessary for the cold nut forming operation.

★ ★ ★

All sizes receive a single draft, keeping the cold reduction to a minimum 12-18% to insure a ductile wire within a specified tensile range of 55,000 to 68,000 pounds per square inch.

★ ★ ★

Below is shown the range of the physicals of Header Nut Wire:

Average Physicals of Drawn Wire, Ult. 55,000-68,000 PSI. Red. Area % 55-65. Elong. 18-25% on 2″.

★ ★ ★

Experience has shown us that best results will be obtained at the forming operation if the physicals are maintained in this range.

★ ★ ★

Identity of each size and heat is maintained throughout all processing operations in the wire mill. Before shipping each coil is suitably identified and both ends of each coil are subjected to a fifty per cent compression test to insure its ability to cold form.

★ ★ ★

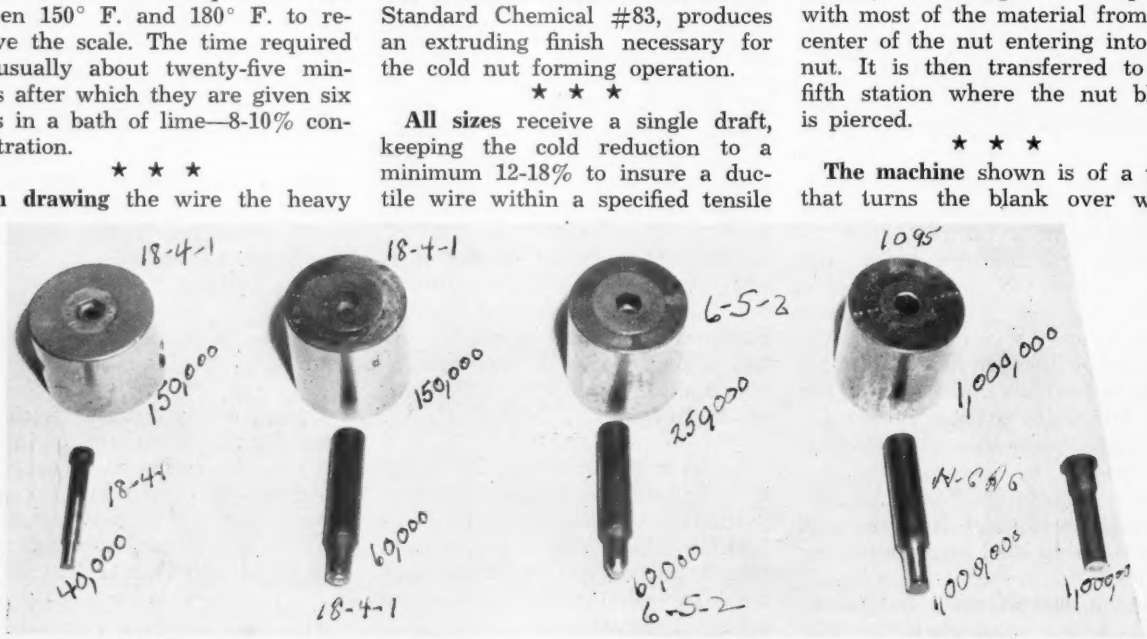
The wire is now ready to be processed into hexagon nut blanks on the cold nut forming machine.

★ ★ ★

A view of a cold nut forming machine, looking down into the tooling, is shown in Figure 1. It is a five-station machine of the transfer type, and a nut blank is produced at each stroke of the machine. The first station cuts off a wire blank which is transferred to a doming station. From here it goes to a hexing station where the hexagon is partially formed; transferred to the fourth station, the hexagon is completed with most of the material from the center of the nut entering into the nut. It is then transferred to the fifth station where the nut blank is pierced.

★ ★ ★

The machine shown is of a type that turns the blank over while



5th Station 4th Station 3rd Station 2nd Station

Fig. 2 — Tooling for a cold nut forming machine. * * * * * * * * * * * * * * * * * *

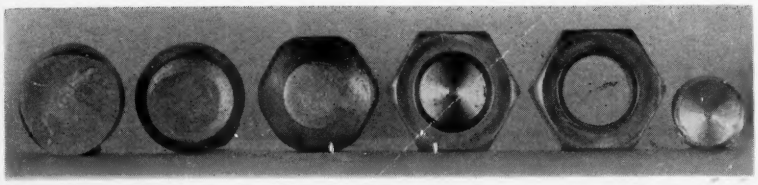


Fig. 3 — Steps in the cold forming of a nut blank. * * * * * * * * * *

transferring it from one station to the next. Some other types of machines for this purpose do not turn the blank over at each operation. It has been our experience that defects in the wire are not as critical in forming operations if the blank is turned over between each operation.

★ ★ ★

In Figure 2 is shown tooling of the second, third, fourth and fifth stations of the cold nut former. From Figure 2 it can be seen that the tooling is of the solid die type and therefore good lubrication is essential in prolonging its life. Although the dies are lubricated by streams of oil, the die life can be markedly affected by the condition of the surface of the wire. The attention given in the wire mill to the wire drawing lubricant can pay rich dividends at this point.

★ ★ ★

In Figure 3 is shown a sample set of the operations from the various stations. One will be impressed by the amount of expansion and compression that the wire blank has undergone in order to become a nut blank. It is also evident that the percentage of scrap has been kept low by movement of material from the centre of the wire blank into the walls of the nut blank. The finish and accuracy are of the best; and since the nut is cold forged to shape, with most of the material from the hole entering into the nut, the only waste is a small slug from the hole. For the particular size of nut shown, the scrap is about 13%, as against approximately 40% for the screw machine method and approximately 45% for the cold pressed method. Nuts made by this method are of comparable quality to nuts made on screw machines, and are largely of the semi-finished type. If the processing of the material has been properly prepared through the various operations, nut blanks of suitable quality will be run at the cold nut forming machine with little trouble and satisfactory tool life.

★ ★ ★

Defects, if allowed to occur at any of the various operations in the preparation of the material, will cause trouble in the operation of the cold nut former or give defective parts at the forming operation.

★ ★ ★

It was indicated above that an extensive rim zone was favored in order to give the best results. In Figure 4 is shown a macrograph of a properly-rimmed billet and the resultant rimmed pattern in the finished wire is shown in Figure 5. Wire with a rimmed pattern such as this will produce nut blanks of the quality shown in Figure 3.

★ ★ ★

In Figure 6 is shown a macrograph of wire having a poorly-defined rimmed pattern; shown in Figure 7 is a nut blank made from wire having this rim pattern. It will be

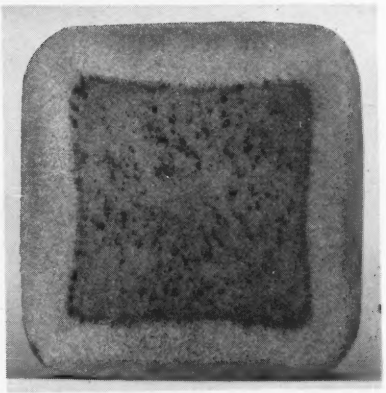


Fig. 4 — ⅓ actual size. Shows well-defined rimmed area in a billet. * * * *

readily seen that it is badly ruptured and not satisfactory for further use. The more ductile rim area has been so thin in spots that it has practically disappeared, and the less ductile core has been unable to withstand the subsequent cold working and has ruptured badly along the edges.

★ ★ ★

The economics of producing any grade of steel makes it desirable to get the highest possible yield from the ingot without endangering the quality. In Figure 8 is shown "piped" wire, and Figure 9 shows nut blanks that have been made from this wire. This has created a problem at the piercing operation on the cold nut forming machine. It makes it impossible to pierce the hole without a bad drag-down of material, and in addition you quite often lose control of the hole size. Even if the operator is successful in maintaining hole size under these conditions, the difficulties encountered in tapping the threads make the further processing of such a part uneconomical.

★ ★ ★

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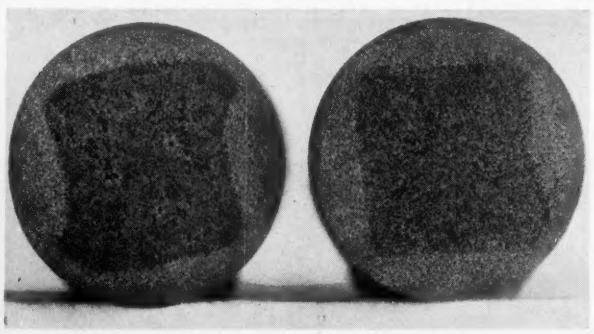

Fig. 5 — Magnification 4X. Shows well-defined rimmed area in wire. * *

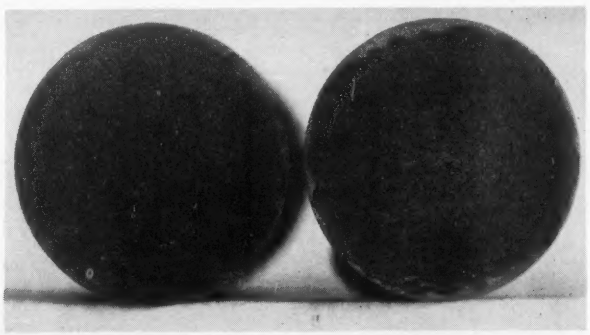

Fig. 6 — Magnification 4X. Shows poorly-defined rimmed area in wire.

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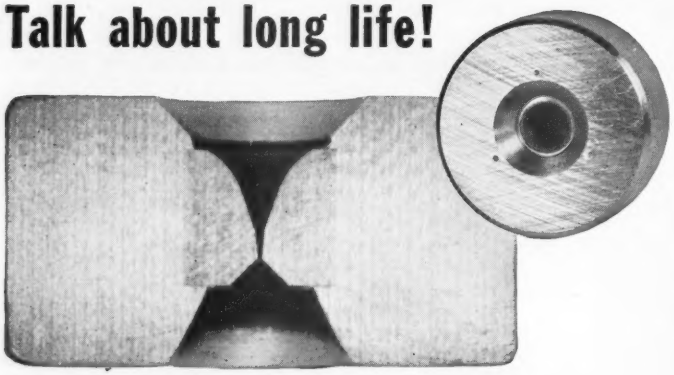
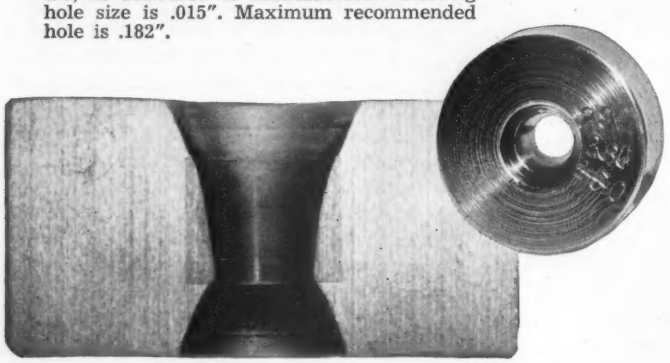


Original Die

Unretouched photo of Carboloy R3 wire draw die, as delivered to manufacturer. Starting hole size is .015". Maximum recommended hole is .182".



Refinished Die

Unretouched photo pictures Carboloy R3 die finished and refinished many, many times to .290", almost twice the recommended maximum. Surface casing stampings of bore sizes were so numerous they had to be machined off to start afresh.

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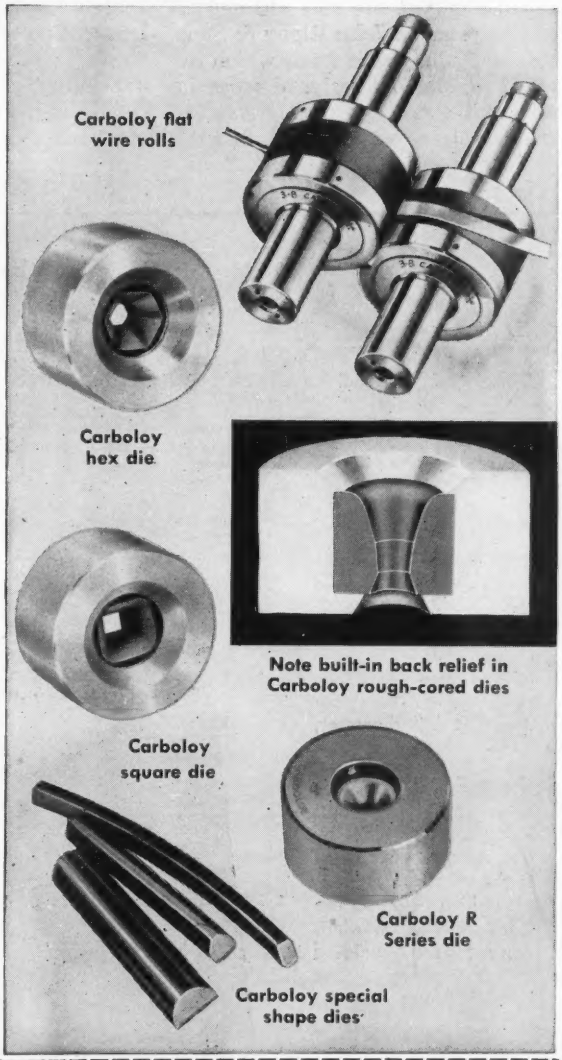
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GOSSIP from BRITAIN

An "old timer" has died. **Mr. Charles Edward Rigby,** one of the old school of wiredrawers, has passed along at the ripe old age of 83. Chairman of **John Rigby & Sons Ltd.,** a leading wire firm, which he joined in 1883, he resigned office in 1949, and retired south. He was instrumental in building the firm to its present dimensions, and was also a leading figure in forming the Iron & Steel Wire Manufacturers' Association (now known as the British Iron & Steel Wire Association). He was a prominent freemason. He left a peculiar request—that his house should remain closed for one month after his death. His wish has been fulfilled. His son, C. Eric Rigby, died a few years ago, and amongst the present directors are Mr. C. Patrick Rigby, his grandson (son of Eric), Mr. John Rigby and Mr. Harold Rigby, nephews, all of whom are well-known in American wire circles. They have been instrumental in introducing several American processes to this country, notably the Lavite and Trauwood processes.

★ ★ ★

Mr. Michael Johnson, the 46 year old chairman of **Richard Johnson & Nephew Ltd.,** of Manchester, has announced a bonus issue of two shares for every one at present held. This brings the capital of the company up to £3,000,000. The firm has been drawing wire since 1773 and for years past has ploughed back profits into the firm instead of paying dividends. They installed a modern wire rod rolling plant about two years back which was fortunate enough to escape nationalization.

★ ★ ★

A scoop has been achieved at the "Festival of Britain" Exhibition, in London, by an advertiser in "Wire & Wire Products", **A. C. Wickman & Co.,** of England and U.S.A., who have shown a wire-forming machine, the only wire working model to be exhibited. It is the combined model of the recently amalgamated competitive machines made by Heenan & Froude, Ltd. of Worcester and Macnama of Birmingham. Wickmans are the sole selling agents. No details of this were given in the advance details of exhibits.

★ ★ ★

Is this a record? The firm of **Riddle, Cousland & Co. Ltd.,** of Glasgow, one of the oldest wire working and weaving concerns in Scotland, has presented six of their employees (including one woman) having between 50 and 69 years service, with gold watches, and a further 35 (including 7 women) having between 25 and 49 years service, with silver watches. As **Mr. J. Cousland,** a director, remarked at the presentation, "wire working was a healthy

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trade, proved by the long life of so many in the firm".

★ ★ ★

All exports of wire of every description, ferrous and non-ferrous, from Britain, are now subject to control, and export licenses have to be obtained.

★ ★ ★

Wire manufacturers and fabricators, have been deeply concerned by a recent official statement made by the President of the Board of Trade, who issued the gravest of warnings regarding the shortage of sulphuric acid, copper, zinc, molybdenum, tungsten, nickel and other non-ferrous metals. He foreshadowed "an unparalleled industrial disaster for this country" unless greater supplies were received quickly.

★ ★ ★

Inflation still grips the vitals of industry, and steady advances of all wire and wire goods continues. Rising prices of raw materials are aggravated by a further transport rise of 10% which has been reflected in coal, and, consequently, all products where heat-treatment is essential.

★ ★ ★

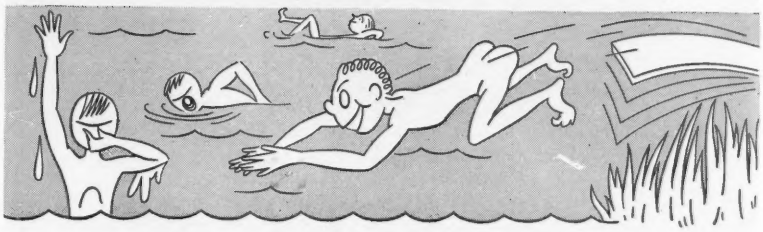
A report from South Africa suggests a serious shortage in that country of galvanized iron and copper coated wire. A relaxation of import control came too late for buyers of raw materials to replenish stocks. The manufacturers, therefore, have plenty of import permits for steel and rods, but "freezing" in other countries, has slowed up supplies.

★ ★ ★

The new South African company, **African Wire Ropes Ltd.**, registered in 1950 with an authorized capital of £1,500,000, co-ordinates the activities of Haggie, Son & Love (1936) Ltd., of Johannesburg, and Rand Ropes (Pty) Ltd., of Germiston. Both factories continue to be closely associated with British Ropes Ltd. of Doncaster, England, and have the benefit of this firm's technical development and research facilities.

★ ★ ★

It is reported from Germany that there is vigorous opposition, both by worker and employer, to the Schumann plan for co-operation between European countries (except Britain) in iron and steel production, and it is doubtful whether the



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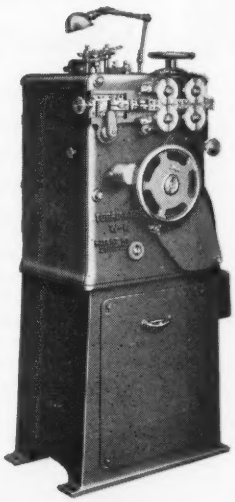

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Wire Length per Spring: 0" to 42" (Extra Wire Feed Gears Available)

Coil Range (O.D.): 3/32" to 1-9/16"

Production: 23 to 190 springs per minute with variable speed drive.

Torsion and other attachments are available.

The TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT

Johnson Quality Wire Is an Economy
For your processes it will pay you well to specify wires made in this specialty mill. You will save time, maintain quality. JOHNSON makes wire as fine as .003".
• MUSIC SPRING WIRE.
• VACUUM HOSE WIRE.
• AIRCRAFT CABLE WIRE.
• HIGH CARBON ROPE WIRE.
• HARD DRAWN SPRING WIRE.
• OIL TEMPERED SPRING WIRE.
• HIGH TENSILE GALVANIZED STEEL WIRE.
• HOSE REINFORCEMENT WIRE (BRAIDED TYPE).
• FLAT AND HALF OVAL SPECIAL SPRING WIRE.
• BRUSH WIRE FOR HAND AND POWER BRUSHES.
If it's steel wire—Johnson makes it better
JOHNSON
JOHNSON STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
New York Philadelphia Cleveland Detroit Akron Chicago
Atlanta Houston Tulsa Los Angeles Toronto

German Bundestag will ratify the plan. Resistance is being organized by all sections of the trade.

★ ★ ★

German stocks of rods, both ferrous and non-ferrous, are in short supply, and production of wire goods is being reduced. Wire machinery is stated to be offered on extending deliveries from 10 months for screw-making plant to 3 years for chain-link fencing. The delivery time for most types averages 18 months.

★ ★ ★

The Colonial Ministry of Portugal reports that they will shortly be in the market for about 5,000 tons of cables for shipment to Mozambique and Abgola this year.

★ ★ ★

Government Wire Production Information

Insulation Aging Procedure Developed by Government

Details of a new procedure developed to determine the aging characteristics of electrical insulation are now available in a report from the Office of Technical Services of the U. S. Department of Commerce.

★ ★ ★

The procedure, developed at the Naval Research Laboratory, uses coils wound and subjected to stresses experienced by motor windings to duplicate physical factors, such as winding stress, bending stress, vibration, electrical stress, etc., which, together with temperature, influence the aging characteristics of insulation.

★ ★ ★

Thus means are provided for checking all factors which influence insulation life, such as temperature, dielectric and mechanical stresses, and contaminants.

★ ★ ★

By using this method, aging characteristics were obtained for Class A insulation. The results indicated that the "10-degree rule" which is employed in design and found useful within reasonable limits of temperature spread is inapplicable in the region below 1000 hours and that further work is required to determine the expected life for all

insulation at elevated temperatures.

★ ★ ★

The report, an interim one, suggests that the effects of humidity, cycling, oxidation and voltage stress on insulation be determined, and the validity of the experimental results be demonstrated on a sufficient number of motors operated to destruction.

★ ★ ★

PB 102619, **Aging Characteristics of Electrical Insulation.** 13 pages including photographs, designs, graphs and tables sells for $.50 per copy. Orders should be addressed to the **Office of Technical Services, U. S. Department of Commerce,** Washington 25, D. C. accompanied by check or money order payable to the Treasurer of the United States.

★ ★ ★

Report on Textile Fibers

New information on the tensile recovery characteristics of textile fibers is contained in a report now available from the Office of Technical Services of the U. S. Department of Commerce.

★ ★ ★

The report, prepared by the Army Quartermaster Corps, presents an account of systematic recovery tests of samples representing sixteen different textile fiber materials. The materials are compared as to the percentage of their elongation which recovers immediately; that which recovers after a defined period of time, and that which remains "permanently".

★ ★ ★

The new electronically-controlled Instron Tensile Tester was used for the tests employing a specially-developed cycling technique. Fibers tested were Fiberglas, cotton, ethocel, Fortisan, Saran, viscose, acetate, nylon, Orlon acrylic fiber, Fiber V, Vinyon CF-HST, NOZZ, NORU, wool, casein and polyethylene.

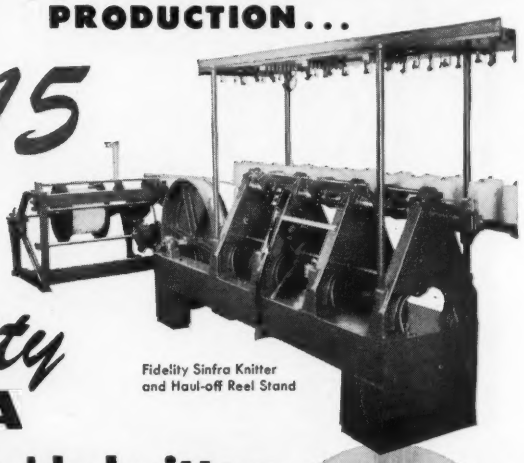
★ ★ ★

Improved equipment will help to eliminate minor inadequacies found in the method, according to the report, and the recovery data secured will lead to a better understanding of the complex behavior of textile materials and their practical implications.

★ ★ ★

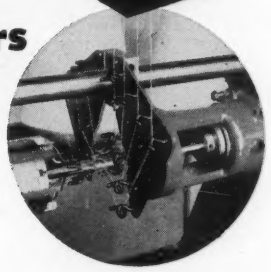
INCREASE YOUR WEATHERPROOF WIRE PRODUCTION...

10-15 times with Fidelity SINFRA wire and cable knitters



Fidelity Sinfra Knitter and Haul-off Reel Stand

- Less Yarn Cost
- 15 Times Productive Output
- 600% Greater Labor Productivity
- Less Floor Space
- Lower Maintenance
- Lower Power Requirements
- Complete Automatic Control
- Minimum Noise
- Easier Working Conditions
- Accepted by ASA, AAR, UL, CSA
- Lower Capital Investment



Enlarged view of Knitting Head

The production of *one* FIDELITY SINFRA wire covering machine is equivalent to the capacity of 15 triple deck braiders! This impressive production achievement is made possible by the reliable and extremely high speed Fidelity Knitting Head, using stationary, large yarn cones.

The SINFRA Knitter is built to the precision standards long associated with Fidelity and is equipped with automatic electric stop motions, controlling both the wire and yarn supply. As the wire enters the SINFRA Knitter it is straightened by a unique straightening device before being passed through a series of 3 knitting heads.

SINFRA Knit is widely acclaimed as the most modern method of covering wire. Wire covered by SINFRA Knit is accepted by the American Standards Association, Association of American Railroads, Underwriters' Laboratories, Inc. and the Canadian Standards Association.

SINFRA Knitter is designed to permit horizontal operation at normal working level. No longer need your operators crawl or stretch to service wire covering equipment and noise level is reduced to a pleasing hum. Top companies have found their answer to production in SINFRA Knitters. Why not write for complete information on this development to lower your production costs and increase your productive capacity.

Write today for literature on this time and money saver.

Manufacturers of intricate precision machinery since 1911.

FIDELITY MACHINE COMPANY INC.

3908 FRANKFORD AVE. • PHILA. 24, PA., U.S.A.

Speeding Rivet Production

According to production men, Keystone Tubular Rivet Wire has what it takes to increase production efficiency.

The special techniques and processing methods developed by Keystone have produced a tubular rivet wire with *exceptional* forming qualities for both extruded and drilled rivets.

The wire recommended for *drilled* tubular rivets has the proper hardness for longer drill life. The wire recommended for *extruded* rivets has uniform metal flow qualities required in extrusion headers. Both types have exactly the right ductility for cold heading and excellent roll crimping.

Regardless of the performance demanded in your products, consult Keystone for the wire to meet your most exacting specifications.

PB 103038, Tensile Recovery Behavior of Textile Fibers, 59 pages including photographs, graphs, tables and bibliography sells for $1.50 per copy. Orders should be addressed to the **Office of Technical Services, U. S. Department of Commerce,** Washington 25, D. C., accompanied by check or money order payable to the Treasurer of the United States.

★ ★ ★

New CMP Information

A transcript of a press conference on the Controlled Materials Plan held by the NPA Administrator, is available. It supplements the pamphlet on C.M.P. previously issued.

★ ★ ★

Other informative material on the "what" and "how" of the program is in preparation and will be issued on a continuing schedule. This will include background material—in pamphlet form—on principles and procedures of CMP, news releases, a detailed CMP Manual based on the actual regulations which will assist manufacturers in operations, form requirements, etc., a Question & Answer booklet drawn from questions raised on various phases of CMP, graphic booklets, auxiliary pamphlets on specific subjects such as record-keeping.

★ ★ ★

An adequate supply of these various items of informational material concerning Controlled Materials Plan will be sent directly to you on request and will also, be available at the various Department of Commerce field offices. In addition, meetings will be set up in key cities to acquaint businessmen and association executives with details of the plan.

★ ★ ★

Because of the limited lead time, all of us face a tremendous task in getting promptly to American industry the basic information required to insure the most efficient operation of the plan. Copies of this transcript and other information may be procured from the U. S. Dept. of Commerce, National Production Authority, Washington 25, D. C., or from any field office.

★ ★ ★

Defense Production Record

The Defense Production Administration has announced that it started issuing a weekly bulletin, beginning May 4th, to summarize week-by-week developments in defense production.

★ ★ ★

The bulletin, entitled Defense Production Record, is being published to fill a need expressed by businessmen, trade organizations and news channels for a compact roundup of official actions taken by D.P.A. and related defense agencies.

★ ★ ★

Its objective is to transmit accurate and concise summaries of defense production measures to the business community primarily through existing outlets, including trade and business magazines, newspapers, columnists and commentators; trade, industry and business associations and their publications, state and municipal governments, and field offices of U. S. Government agencies and departments.

★ ★ ★

The bulletin will interpret and explain the need for and the purpose of such official actions.

★ ★ ★

It will be free to newspapers and trade publications. Business firms and other organizations may get the weekly bulletin for $2.50 a year ($4 foreign) from the Superintendent of Documents, Government Printing Office, Washington, D. C. It will be mailed to subscribers each Friday.

★ ★ ★

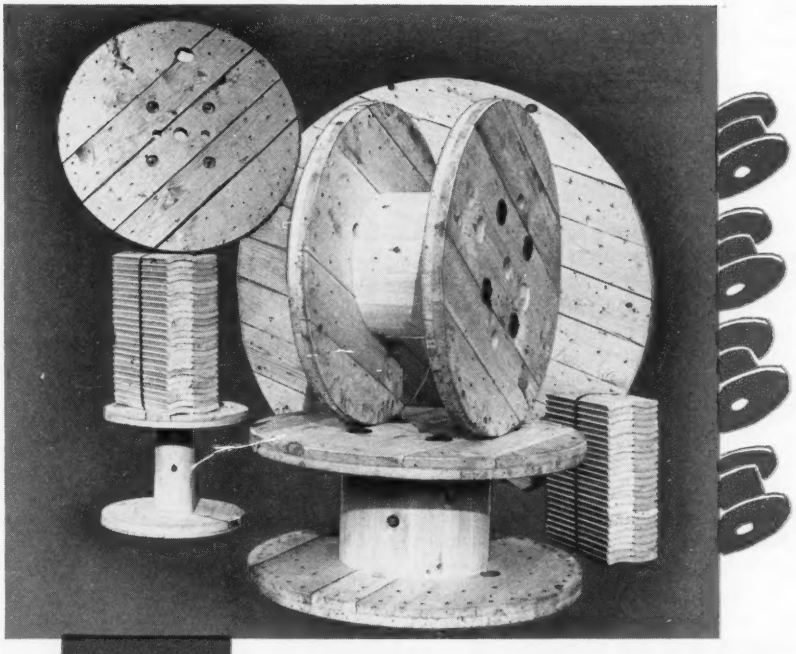
It will also be distributed to Government agencies concerned with defense production and to their field offices.

★ ★ ★

The Record will be published for DPA by the Office of Public Information of the **National Production Authority, U. S. Department of Commerce,** with the cooperation of information offices in related defense production agencies. Copies will be available to the working press in the NPA press room, Room 5002, Department of Commerce, each Friday afternoon.

★ ★ ★

It will be of business letter size and will contain from 16 to 24 pages.



FOR CABLE ROPE WIRE

ALL SIZES AND TYPES.
SHIPPING AND SHOP REELS.

WOOD REELS

RETURNABLE AND NON-RETURNABLE

BRIDGE REELS are LOW IN COST, RUGGED in CONSTRUCTION for SEVERE HANDLING, and WELL MADE.

Our trucks will deliver reels to your door if you are within 200 miles of Hazardville. Fast freight service will reach points as far away as St. Louis in three days or Cleveland in two days.

SIZES: FROM 12" to 96" IN DIAMETER

ALSO, REEL HEADS FOR STEEL DRUMS

Our streamlined production methods give you reels of the best possible construction at costs that represent real savings. This, plus our unique distribution system, offers you a dependable, efficient source of supply for your reels.

Reels are furnished knocked down or assembled. Standard sizes in stock, special reels made to your specifications on short notice.

TRY BRIDGE REELS for quality and service.

BRIDGE
MANUFACTURING CO.
HAZARDVILLE, CONN.
Phone Thompsonville, 3375

Let us quote on your reel needs.

Outstanding Personalities of the Wire Industry

Roebling Company Appoints New Sales Executive in Electrical Wire Division

Stuart E. Yeaton, general product manager of the electrical wire division, **John A. Roebling's Sons Company,** Trenton, N. J., announces the appointment of **Walter Whiting** as Chicago district manager. Mr. Whiting, who is a native of Portland, Ore., assumed his new duties on May 1.

★ ★ ★

Mr. Whiting has been associated with the Roebling Company since 1929, starting as a warehouseman in the Portland branch. The following year he was transferred to the office staff, and in 1935 became a salesman in the Oregon territory, the position he held until his recent appointment.

★ ★ ★

With headquarters in Chicago, the sales territory covered by Mr. Whiting's new assignment includes: Wisconsin, Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, Missouri, Illinois, Indiana and part of Michigan.

Walter Whiting, Chicago District Manager, John A. Roebling's Sons Co.

★ ★ ★

Named to New Post by American Steel & Wire

Appointment of **Roger W. Berrett** to the newly created position of senior assistant purchasing agent of **American Steel & Wire Company** has been announced by **Frank E. Chesney,** purchasing agent.

★ ★ ★

Mr. Berrett's appointment was one of four changes in the department's personnel. **T. M. Haddock** was appointed assistant purchasing agent, and **W. W. Oliver** was named to succeed him as eastern district purchasing agent. **Elmer R. Johnson** was appointed as assistant purchasing agent for the eastern district. Mr. Berrett has been associated with the company since November, 1926.

GLADER

HIGH SPEED WIRE NAIL MACHINES

HIGH TONNAGE OUTPUT—LOW MAINTENANCE COST

You can take care of increased production schedules and better product demands with these machines of established reputation.

For 55 years GLADER MACHINES have been giving HIGH QUALITY, LOW COST nail production.

Wm. Glader Machine Works 210 N. Racine Avenue Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Changes in Norton Field Representation

Two Norton Abrasive Engineers were transferred to new territories May 1. Announcement was made recently by Ralph M. Johnson, vice president in charge of sales.

★ ★ ★

John R. H. Truelsen, formerly responsible for southern Wisconsin, has assumed responsibility of northern Illinois. He will continue to operate under the direction of Raymond E. Taylor, Chicago district manager.

★ ★ ★

F. Donald Wing, field engineer in Chicago, has been appointed Abrasive Engineer. He is to assume the responsibility of southern Wisconsin to succeed John R. H. Truelsen. He will also work under the direction of **Raymond E. Taylor.**

★ ★ ★

Alcoa Elects New Officers

Roy A. Hunt, President of **Aluminum Company of America** since 1928, was named Chairman of the Executive Committee and **I. W. Wilson,** Senior Vice President, was made President of the Company at a recent meeting of Alcoa's Board of Directors. **Arthur V. Davis** continues as Chairman of the Board. The Board also elected **Leon E. Hickman** as Vice President and General Counsel.

★ ★ ★

Mr. Hunt, son of the late Captain Alfred E. Hunt, first president and one of the founders of the company, started with Alcoa at the New Kensington, Pa. works in 1901 as a machinist's helper. He continued at New Kensington until 1914 when he was transferred to the Pittsburgh Office as General Superintendent of the Company's fabricating plants. He was made a Director in 1915, a Vice President in 1918, and was elected President in 1928.

★ ★ ★

Mr. Hunt's 23 years as head of Alcoa has been the longest presidential tenure in the Company's history, spanning its most outstanding period of growth and expansion. Since 1928 Alcoa's annual production has increased from 247,000,000 pounds to 707,000,000 pounds in 1950. During the same period, the number of employees has increased from 20,000 to approximately 50,000. Land, plant and facilities have increased from $156,000,000 to $702,000,000. In 1928 the company's earned surplus was $10,000,000 as compared to $239,000,000 at the end of 1950.

★ ★ ★

Aloca's new president, I. W. Wilson, now in his fortieth year with the company, is one of the foremost figures in the aluminum industry. He began his career with Alcoa in 1911 at Niagara Falls, N. Y., following his graduation from Massachusetts Institute of Technology. He became general superintendent of the Company's reduction plants in 1921, and was named vice president in charge of operations in 1931. Elected a director in 1939, he was made senior vice president in 1949.

★ ★ ★

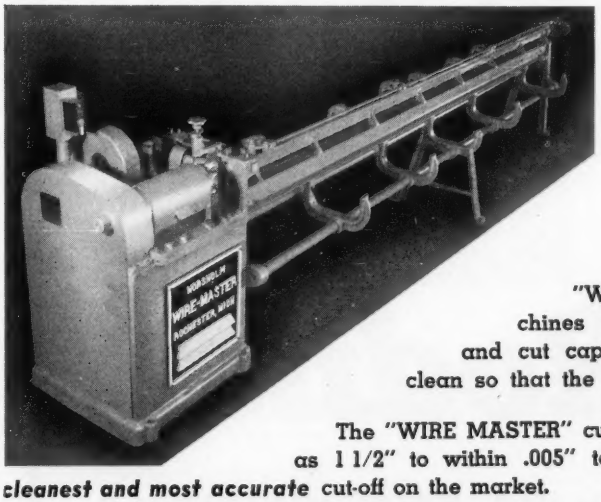
E. F. Houghton Appointment

Charles R. Schmitt was appointed manager, lubrication sales department, **E. F. Houghton & Co.,** Philadelphia. Formerly lubrication manager for the central and western division, Mr. Schmitt was transferred to the company's main office in Philadelphia from Cleveland. He joined Houghton in 1942.

★ ★ ★

Faster, More Accurate
STRAIGHTENING and CUTTING
with the
NORSHOLM "WIRE MASTER"

So fast, a customer is finding that *two* machines will do the work of *six* machines formerly used.



Model A, shown, will handle .040" to .156" wire.

Other models will handle up to .312"Stock,round.

NORSHOLM "WIRE MASTER" machines will also straight and cut capillary tubing. Cuts clean so that the hole is not closed.

The "WIRE MASTER" cuts lengths as small as 1 1/2" to within .005" tolerances, with the *cleanest and most accurate* cut-off on the market.

IT'S RUGGED, VIBRATIONLESS, FAST!

As to speeds, 180 to 200 F.P.M. is the minimum to be expected. Your cutting jobs will be studied and speeds *guaranteed.*

Also makers of heavy duty double, tilt type and single wire reels.

Write today for information on these remarkable machines

NORSHOLM INDUSTRIES
370 WEST AVON RD. • ROCHESTER, MICH.

Firth Sterling Appointments

The Firth Sterling Steel and Carbide Corporation has made a number of important appointments in the operating end of its business. **J. T. O'Brien** has been made Works Manager of the Steel Division, which includes the Globe Wire Division at McKeesport. He started with Firth Sterling in April, 1949, a Superintendent of the Steel Division. He was formerly associated with the Carnegie-Illinois Steel Corporation at its McDonald Mills in Ohio.

★ ★ ★

T. G. Barnes has been made Production Manager of the Company. Prior to coming here, he was with the Reynolds Alloy Company in Alabama as Superintendent of the Foil Division.

★ ★ ★

W. P. Nolan was appointed to the post of Chief Engineer. He has been with the company since 1941 and before that was with the Weirton Steel Corporation.

★ ★ ★

T. F. Nakles has been made Superintendent of Maintenance, having formerly been the Assistant Superintendent of Maintenance. He

J. T. O'Brien, Works Manager Steel Division Firth-Sterling Steel & Carbide Corporation. *

was previously associated with the Olson Engineering Company as Chief Engineer.

★ ★ ★

American Chain and Cable Elects Officers

Wilmot F. Wheeler has been elected chairman of the board of directors of **American Chain & Cable Company, Inc.**, and will continue as its chief executive officer. **Cyrus N. Johns** has been named president, and Colonel **Harry D. Weed**, the inventor of the Weed Tire Chain, has been added to the board of directors.

★ ★ ★

Mr. Wheeler, who succeeds Walter B. Lashar retiring because of ill health, has been president of the company since 1916.

★ ★ ★

Mr. Johns, who has been in the employ of the company since May 1, 1917, was general manager of the Page Steel & Wire Division at Monessen, Pa.

★ ★ ★

Lindberg Opens Atlanta Office

Lindberg Engineering Company, Chicago, manufacturers of heat treating furnaces and melting furnaces, has announced the opening of a direct factory sales office in Atlanta, Georgia, June 1st.

★ ★ ★

Philip J. Duffy will be moved from the Chicago office to take charge of this office, which covers the states of Georgia, Alabama, Mississippi and Florida.

★ ★ ★

SAVE ACID WITH Rodine®

PICKLING ACID INHIBITORS

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of METALLURGICAL, AGRICULTURAL and PHARMACEUTICAL CHEMICALS

Industrial Ovens President Visiting European Plants

C. A. Litzler, president of **Industrial Ovens, Inc.,** 13825 Triskett Rd., Cleveland 11, Ohio, sailed May 8 on the Queen Elizabeth for a two months visit to 19 major industrial centers in western Europe. He is scheduled to meet with officials of some 32 European industrial concerns before he returns to the United States.

★ ★ ★

Mr. Litzler is making the trip at the request of several European companies to consult with them regarding new types of processing equipment developed by Industrial Ovens for use in the tire fabric and vinyl coating industries and the plastic jacketing of wires and cables. He will also inspect Industrial Ovens equipment recently installed or now in process of erection in a number of European plants.

★ ★ ★

His itinerary includes stays in Milan, Italy, Zurich and Lucerne, Switzerland, Hanover, Germany, Liege, Belgium, Amsterdam and Helmond, The Netherlands, Paris, Lyon and Colombe, France, London and Birmingham, England. He will return on the Queen Mary arriving in New York on June 27.

★ ★ ★

A. C. Towne to Head Michigan Oven

A. C. Towne, Jr. was recently elected President of the **Michigan Oven Company.** Mr. Towne was one of the founders of Michigan Oven Company and has been the Buffalo District Manager since the incorporation of the Company. He has also served as a members of the Board of Directors for the past two years.

★ ★ ★

Mr. Towne has appointed **William Jarvis** as General Manager. Mr. Jarvis formerly was associated with Young Brothers Company, as Chief Draftsman and has spent the past seven years as Chief Engineer of Detroit Sheet Metal Company.

★ ★ ★

Since the incorporation of Michigan Oven Company two years ago, the Michigan Oven Company has progressed to become a well-established manufacturer of industrial ovens for such industries as the electrical, textile, foundry, finish baking, heat treating, etc., both national and international in scope.

★ ★ ★

Willard Crater Appointment

Appointment of **Willard deCamp Crater** as assistant sales manager of Marvinol vinyl resins for Naugatuck chemical division, **United States Rubber Company,** has been announced by **Harold M. Parsekian,** sales manager.

★ ★ ★

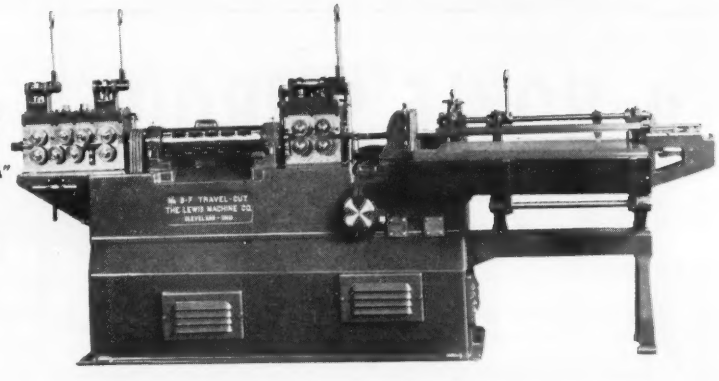
In his new capacity, Mr. Crater will develop new markets for vinyl resins and direct sales activities. He will make his headquarters in the division's Naugatuck, Conn., plant.

★ ★ ★

He joined Naugatuck chemical in December, 1949, after wide experience in plastics research and manufacturing with Hercules Powder Co., Federal Telephone and Radio Corp., and the Glenn L. Martin Co. He holds numerous patents in plastics used in the wire and cable industry and other fields.

★ ★ ★

Fast, Accurate, Economical
STRAIGHTENING and CUTTING
with LEWIS **TRAVEL-CUT**
MACHINES



22 Models to handle from 1/16" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California

CANADIAN: Empire Engineering Co., 11 Wellington St. E., Toronto 1, Ontario.

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HIGH PRODUCTIVITY · · ·
LOW PRICE

WITH

POURTIER *Winding Machines*

INDIVIDUAL WINDING HEADS for wires, .04″ to .14″ High speed of more than 900′ per minute. Automatic stop motion in case of supply running out, in case of breakage or loop. Constant linear speed and tension on the reception drum.

Each head equipped with an electric counter which stops the machine for any predeterminated yardage.

The traverse motion's speed and displacement are easy to set up.

Reception motion convenient for drums until 20″ diameter of flange and 9″ overall width.

Each head equipped with its individual motor.

Short delivery.

POURTIER MACHINES

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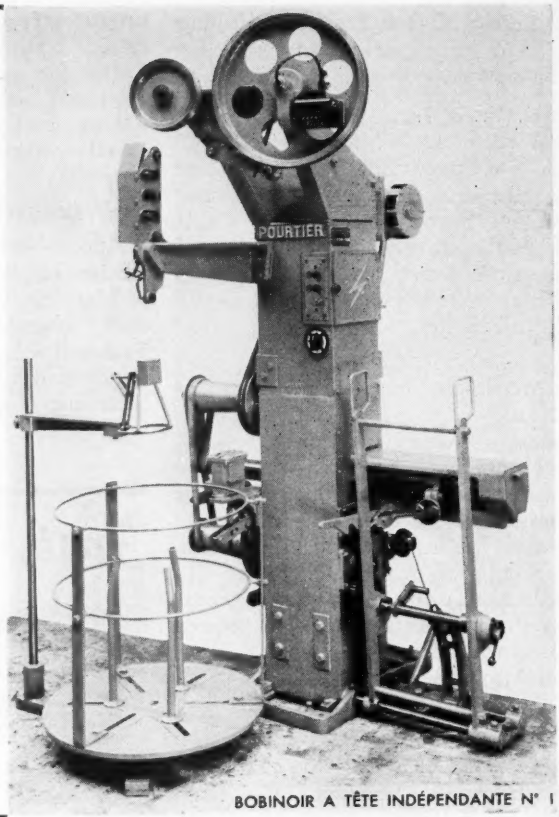
Romainville-Seine France



BOBINOIR A TÊTE INDÉPENDANTE N° 1

the ROYLE SPIROD* EXTRUDER

A completely new and different concept of electrically heated extruder designed for plastics materials. . . . Higher operating temperatures. . . . Lower operating costs. . . . Radiant heated. . . . Zoned as required throughout cylinder and head. . . . Even and controlled cooling. Royle Spirod Extruders have been field-tested and their stamina proved. Check these features that assure trouble-free operation —positive results.

- Heavy steel members without flanges
- Spirally installed rod type heating elements provide faster and more even distribution of heat
- Radiant heat provides steadier temperatures
- Complete insulation reduces heat loss with substantial power savings
- High watt capacity heating elements provide faster heat at lower cost
- Long life heating elements provide high and sustained operating temperatures
- Separate heating zones controlled by proportioning instruments
- Simple installation should replacements become necessary

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

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SHerwood 2-8262

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J. C. Clinefelter
JEfferson 3264

Los Angeles, Cal.
H. M. Royal, Inc.
LOgan 3261

PATERSON 3, NEW JERSEY

A Review of Recent Wire Patents

No. 2,546,977, MANUFACTURE OF STRANDED WIRE CABLES, patented April 3, 1951 by Frank A. Clary, Jr. and Grant N. Willis, Bristol, Conn., assignors to Johnson Steel & Wire Company, Inc., Worcester, Mass., a corporation of Massachusetts.

A flyer is associated with each group of supply reels to impart a double twist to strand composed of wires drawn from the reels as they converge toward the cable closing die, and a false twister is located between the die and each group of supply reels to kill the strands in advance of entering the die.

★ ★ ★

No. 2,547,047, METHOD OF PRODUCING INSULATED MAGNET WIRE, patented April 3, 1951 by Harry L. Saums, John H. Vail, and Howard W. Sturgis, Muskegon, Mich., assignors to Anaconda Wire and Cable Company, a corporation of Delaware.

The wire is coated with gelable lacquer and the coating reduced in diameter and cooled prior to winding into an electric coil.

★ ★ ★

No. 2,547,122, WIRE CLOTHESPIN, patented April 3, 1951 by Roger N. Heston, Nampa, Idaho.

This clothespin is formed wholly of a single length of wire, bent to shape.

★ ★ ★

No. 2,547,510, COMPOSITION AND PROCESS FOR ELECTROLYTIC CLEANING OF METALS, patented April 3, 1951, by Hugh G. Websterm, Detroit, Mich., assignor to J. H. Shoemaker, Detroit, Mich.

For electrolytically cleaning metal, the inventor provides a composition comprising 75 to 90 percent by weight of caustic alkali, 7 to 13 percent by weight of sodium chloride, 0.5 to 5 percent by weight of sodium aluminate and 0.5 to 10 percent by weight of alkali cyanide.

★ ★ ★

No. 2,548,248, COILED STOCKHOLDING FIXTURE, patented April 10, 1951 by Harold G. Wiebe, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A removable fixture is provided, applicable to a reel for holding the end of a coil of strip material on the reel and comprises a pair of members connected to move one of the members relative to the other to clamp the end portion of the coil of strip material therebetween. Additionally there is adjustable means carried by one of the members operable to clamp the members to the reel.

★ ★ ★

No. 2,548,349, BEDSPRING, patented April 10, 1951 by Louis Isreal Cohn, Philadelphia, Pa.

The structure includes serried longitudinally and transversely spaced apart wire coil springs connected at their upper ends by specially designed rubber members.

★ ★ ★

No. 2,548,968, SPRING CONSTRUCTION, patented April 17, 1951 by Jacob Goldstein, Mishawaka, Ind.

Sinuous, outwardly-bowed spring elements are provided, arching one side of the foundation frame, with like but inwardly-bowed springs between the outwardly-bowed springs, with the inner ends of the former anchored to a reinforcing bar.

★ ★ ★

No. 2,549,061, MACHINE FOR SHAPING WIRE STRANDS FOR SCREENS, patented April 17, 1951 by Florian F. Dauenhauer, Santa Rosa, Calif.

There are sixteen claims to this patent to a screen for screen-type conveyors in which there is a flat mesh and the screen will flex in one direction only.

★ ★ ★

No. 2,549,101, INSULATED ELECTRICAL CONDUCTOR, patented April 17, 1951 by William Koch, Wilmington, Del., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware.

More specifically, the invention resides in the insulation which comprises a plastic composition of ethyl cellulose (43.5 to 50% ethoxyl, 50 to 1000 centipoise viscosity) 100, mineral oils 5 to 24, partially hydrogenated mixture of isomeric terphenyls 13 to 32 and polyvinyl butyral

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

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See Page 478 For News of the JLE Automatic Coiler.

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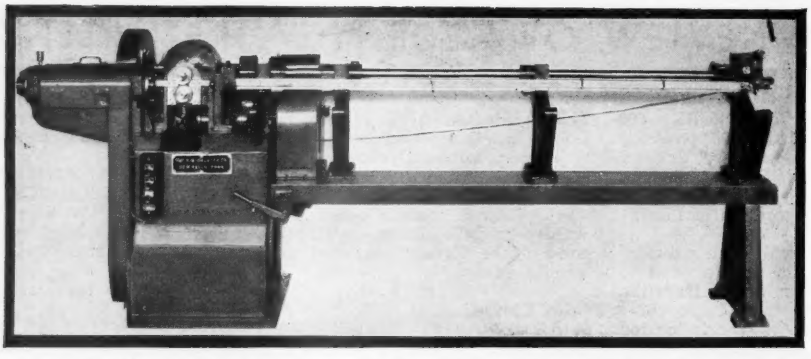

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PHILADELPHIA PENNSYLVANIA U.S.A.

(hydroxyl content 11.25 to 13.25% not more than 42.

★ ★ ★

No. 2,549,322, WIRE PACKING APPARATUS, patented April 17, 1951 by Clarence E. McKinsey, Painesville, Ohio, assignor to General Electric Company, a corporation of New York.

The apparatus is for automatically loadisg endwise into cartridges, wires having weighted ends.

★ ★ ★

No. 2,549,338, MACHINE FOR MAKING SPRING LINERS, patented April 17, 1951 by Anthony Shaner and John C. Hampson, Detroit, Mich., assignors to Falls Spring & Wire Company, Detroit, Mich., a corporation of Michigan, and Great Lakes Spring Corporation, Chicago, Ill., a corporation of Illinois.

This machine comprises an elongated platform, a movable mounted member on the platform adapted to travel the length thereof, a device for feeding successive sections of laterally bent wire stock upon one end of this platform, and a device for causing the member to engage successive sections of the bent wire stock as it is fed upon the platform and to carry the same therewith while it travels to the other end of the platform.

★ ★ ★

No. 2,549,500, ADJUSTABLE GARMENT HANGER, patented April 17, 1951 by Lawrence W. McClain, St. Joseph, Mo.

The hanger is constructed of bent wire.

★ ★ ★

No. 2,550,294, BEDSPRING, patented April 24, 1951 by John Platis, Corpus Christi, Texas.

An insert for bed springs is provided comprising U-shaped resilient web adapted to be interposed between selected bed springs, this web comprising a number of resilient members and a device for joining the terminal portions thereof, comprising a number of parallel rods, and the web depending below the upper level of the bed springs to form a cradle to receive a mattress connecting means.

★ ★ ★

Booklet on Coppercoating

Fluidox, a product for coppercoating steel wire, is described in a booklet published by **The Techema Corporation** of 1200 Niagara St., Buffalo 13, N. Y. and 765 Kingston Road, Toronto, Canada.

★ ★ ★

The booklet tells how to use Fluidox and gives information on its characteristics. Applied to wire before drawing, the compound builds up a tough coating that will not scale or rub off in the passage of the wire through the drawing dies, nor will the coating develop dark discoloration spots.

★ ★ ★

For every ton of finished wire only one pint of Fluidox is required, the booklet states, so that the treatment is economical, as well as simple in application. Where subsequent tinning, galvanizing or enameling is contemplated, the use of the compound is recommended. Its use also facilitates the drawing of wire and is said to add to die life.

★ ★ ★

A copy of this informative booklet may be obtained by writing one of the offices mentioned above.

★ ★ ★

Sheet & Tube Advances Senzik

Frank Senzik has been appointed assistant superintendent of construction for the Youngstown district of **The Youngstown Sheet and Tube Company.**

★ ★ ★

Senzik is a native of Youngstown, attended Youngstown public schools and received his bachelor of science degree in civil engineering from Ohio University.

★ ★ ★

At the age of 19 he joined The Youngstown Sheet and Tube Company as a crane follower during vacation. Later he became a draftsman for Bethlehem Steel Co., returning to The Youngstown Sheet and Tube Company April 14, 1941, as a field engineer in the construction department.

★ ★ ★

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Wire men everywhere concede that nobody in the world can match our precision straightening and cutting. This reputation springs from almost two decades of flawless workmanship for the automobile, aircraft, radio, television, communications, toy and textile industries.

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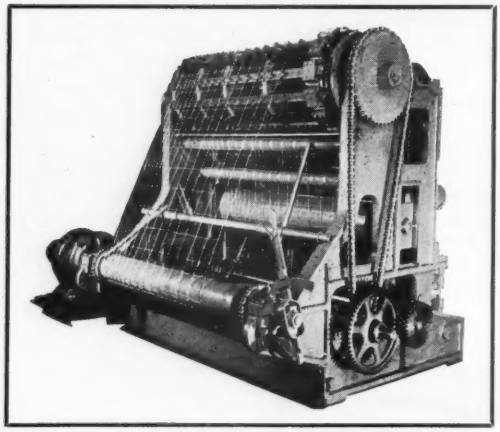

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SECO TRAVERSE REEL SPEEDS UP PRODUCTION

This new SECO Traverse Reel winds five separate coils of flat wire or narrow strip *at the same time.* Coils are oscillated-wound, permitting much longer lengths than conventional ribbon-wound coils. Smooth, powerful hydraulic operation gives coiling speeds as high as desired, accurately controlled from zero to top running speed.

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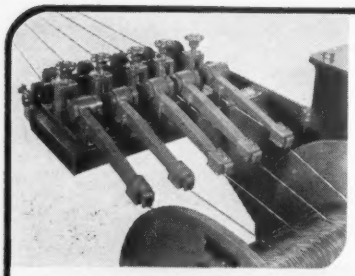

Method of coiling is shown in photo at left The complete block oscillates, traversing the wire into five 3" wide coils. Traverse and tension control are extremely accurate. 1/8" to 1/2" wide flat wire can be wound. Block has 16" inside diameter and 24" outside diameter.

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SECO

Wire for Fasteners

(*Continued from page* 491)

All through the breakdowns on the various mills a great deal of attention was paid to getting good surface finish, and at the wire mill compression tests were performed

Fig. 7 — Magnification 3X. Shows a badly fractured nut blank made from poorly rimmed wire.

on both ends of the coil in order to check its ability to cold form without rupturing and splitting. In Figure 10 is shown a sample of wire with a surface defect, and in Figure 11 nut blanks which cracked at this defect during the cold forming operation.

★ ★ ★

All the precautions taken in the processing of stock prior to the forming operation are useless if the nut manufacturer does not give proper attention to his machine and tooling. In Figure 12 is shown a set of samples that were taken from the cold nut forming machine when the cut-off station had become dull. A lip had formed on the wire blank at the cut-off operation which had resulted in a cracked condition in the finished nut blank. If the tool was allowed to continue to run, the

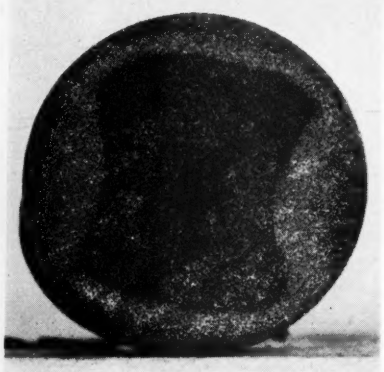

Fig. 8 — Magnification 3X. Shows a piped condition in wire. * * * * *

Fig. 9 — Magnification 3X. Shows nut blanks made from piped wire. * * * * *

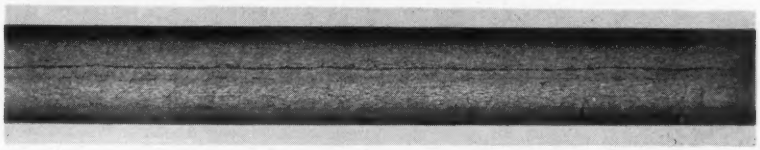

Fig. 10 — Actual size. Shows surface defect in wire. * * * * * * * *

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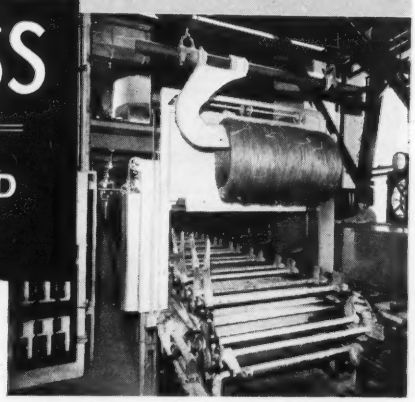
with the ROSS STRAIGHT-LINE WIRE and ROD BAKER



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Operation of the ROSS automatic baker with its intermittent conveyor system has resulted in (1) doubling the plant capacity, (2) greatly increasing cleaning house efficiency and (3) reducing labor cost by half and more. All processing operations are completed without manual handling. Ask us to show you how conveyorized rod and wire baking can quickly pay for its cost in savings secured.

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condition would continue to get worse.

★ ★ ★

It was pointed out previously that a desirable rimmed condition could be obtained without difficulty if it were not for the addition of sulphur. In order to enhance the rimming action, the sulphur is kept as low as possible consistent with thread tapping operations. Sulphur limits of 0.075 to 0.10% are satisfactory for thread tapping in steel of this type due to the extensive amount of cold work that takes place at the cold nut forming machine. Sulphur limits of this nature in a hot rolled steel flat used for cold punched nut blanks would create problems at the thread tapping operation, but are perfectly satisfactory in Header Nut Wire.

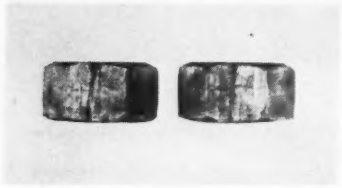

Fig. 11 — Actual size. Shows cracked nut blanks made from wire with surface defects.

★ ★ ★

The Header Nut Wire that I have discussed must withstand a great deal of pushing around with the objective of lowering scrap loss. This is a typical condition as demands of the Fastener Industry tend towards wire that can stand terrific cold working in order to eliminate costly cutting operations and high scrap loss.

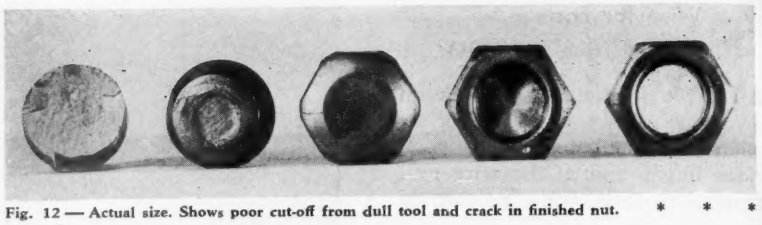

Fig. 12 — Actual size. Shows poor cut-off from dull tool and crack in finished nut. * * *

★ ★ ★

Jo . . . .

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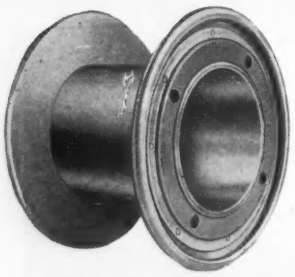

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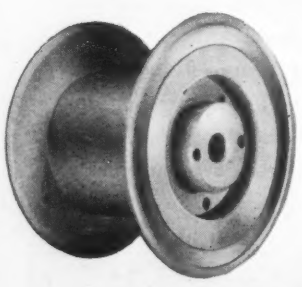
The degree of efficiency obtained by the HIGH SPEED WIRE DRAWING MACHINE is largely dependent upon the accuracy and durability of the take-up spool.

The use of our PRECISION SPOOLS will increase your machine efficiency and eliminate your spool difficulties.

Complete range of sizes.



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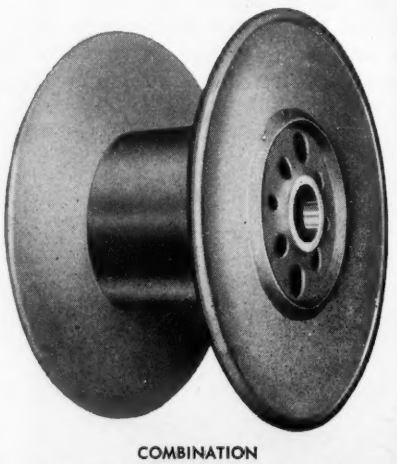


COMBINATION
500 lb. CAPACITY WIRE DRAWING—
ANNEALING — STRANDING — REEL.

Some Developments in Nylon and Polethylene Wire Extrusion

(*Continued from page* 488)

is done in the tension stand and accumulator.

★ ★ ★

Because this wire has a relatively low breaking strength, low final winding tensions are required. Approximately ten to twenty pound tensions are applied to the wire to give proper winding on the final winding reel. Usually the tension stand in a system of this type is counterbalanced to provide for this minimum winding tension on the wire.

★ ★ ★

Contrary to general belief, the counterbalancing of the mass of dancer sheave cannot be done to zero tension because of the general inertia of the mechanical parts of the system. In the case where zero tension is required, and the handling of this type of wire is not one of these cases, other means of synchronizing must be used.

Insulation Breakdown Tester

Conventional spark testing machines are normally introduced into the system at the point before final windup.

★ ★ ★

Although the specific requirements do not cover voltage breakdown indication in process jacketing, a voltage breakdown indicator will at least indicate faults which can be repaired prior to secondary jacketing with the nylon sheathing.

★ ★ ★

The final test requirements are for 1000 volt potential underwater for a specified period of time.

★ ★ ★

The use of an in-process spark tester undoubtedly would discover faults which can be corrected, especially if these faults are due to improper extrusion and consequently these faults can be remedied before large amounts of scrap wire are run.

Synchronous System Drive

The wire drive in a system of this type is one which is rather unusual in its design. In the normal extrusion operation, a synchronized power to drive the takeup is usually transmitted from the capstan housing to the takeoff by mechanical lineshafting. At the front end of the machine, the friction unwind stand is used and the wire is called upon to actually do the work of rotating the unwinding reel. Usually, inadequate hold-back braking tension is applied to the reel. This method might represent one means of providing a drive for the wire, but it is far from the most satisfactory and, in the long run, it is by far the most expensive.

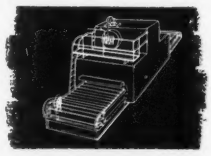
★ ★ ★

Because of the nature of the wire involved, in this particular case, a friction type drive is an impractical solution. Broken wire, faulty insulation and eccentric coatings are likely to result. Accordingly, in the design of a drive for this type of wire, it was decided that the following components would be separately but synchronously driven:—

1) **Wire letoff stand.**
2) **Wire capstan.**
3) **Wire takeup machine.**

★ ★ ★

The obvious solution to the particular problem was the use of a variable voltage system drive. Because of the wide acceptance of this type of drive in other extrusion op-



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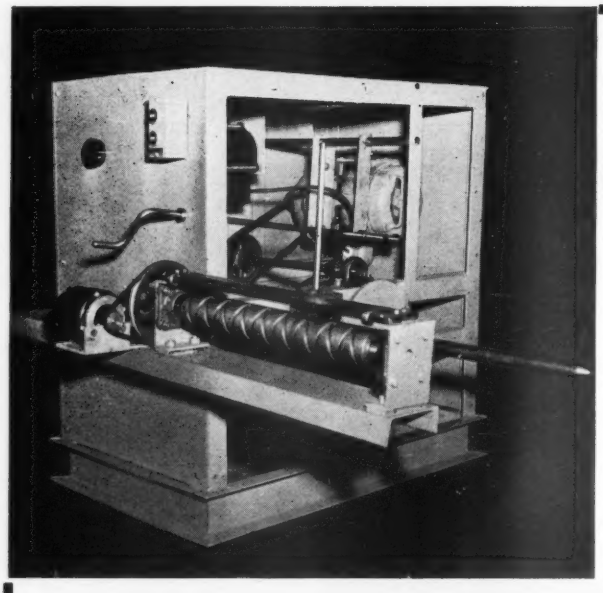

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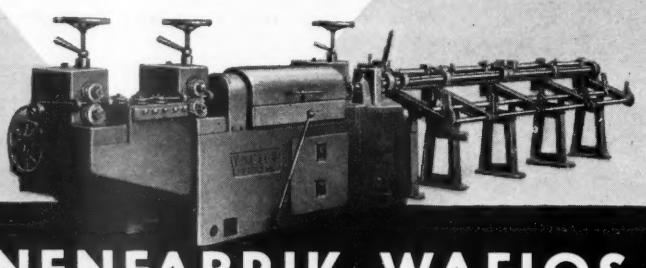

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erations, it was used in this particular case. However, in further analysis of the total requirements of the system drive, especially in relation to speed range and reel buildup, it was impossible to provide a reasonably priced drive to cover all of the requirements. Accordingly, it was further decided that a combination of a variable voltage electric drive and a mechanical transmission drive with servo-hydraulic control would be utilized.

★ ★ ★

The total drive system is indicated on the following slide. The drive system that was used is as follows:—

★ ★ ★

The power to each of the transmission rotating the three driven elements was supplied from main D/C motor generator sets to each one of the three D/C motors located in the wire letoff stand, the wire capstan and the wire takeup machine. The three D/C motors in each one of the component parts of the line in turn were used to drive a variable speed mechanical transmission equipped with servo-hydraulic speed control. This hydraulic control, in turn, was operated through its range by means of hydraulic transmitters which were connected to the floating sheaves of the tension stands and each transmitted the movement of these tension stands to the variable speed transmissions.

★ ★ ★

As the floating sheaves in each one of these tension stands altered its position, the unwinding and the winding reel speed was increased or decreased to suit the known wire speed condition as determined by the tension stand.

★ ★ ★

In this particular range drive, the variable voltage output of the main generator set was directly controlled by one main motor operated rheostat which rheostat controlled the basic speed of the wire through the system. In other words, at any given speed condition, the voltage that was transmitted to these three motors was almost identical so that these motors, in turn, operated at almost equal speeds.

★ ★ ★

The minor differences in the speeds of these motors reflected in a change of position of the dancer sheaves and the dancer sheaves, in turn, altered the output speed of the hydraulically controlled transmissions so that regardless of the base motor speeds, the final roll drive speeds were synchronous with the wire speed.

★ ★ ★

Thus, with a combination of two drive systems, it was possible to provide a full range of speed, accurate tensions and speed requirements that a line of this type requires.

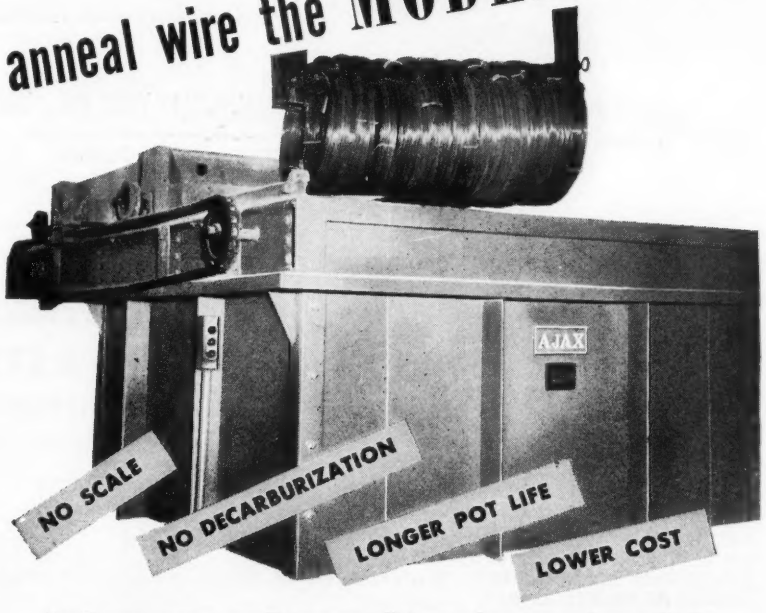
★ ★ ★

In order to provide additional flexibility in the operation of this line, not only for the handling of nylon and polyethylene but for future consideration of other types of wire and cable, a wider speed range of approximately 50 to 1600 feet per minute was provided. To this base wire speed is added the speed change due to reel buildup. Usually this buildup is 2½ to 1, so the total speed range of the system is really 80:1.

★ ★ ★

In order to provide for this wide speed range, four fixed ratio, manual control transmissions were provided in each one of the base ro-

anneal wire the MODERN way!



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AUTOMATIC SPARK TESTER — For the accurate location of dielectric faults in insulating wire coating. Used in continuous line with plastic extruders or curing equipment. Voltage range of 3,000 to 16,000 volts.

CAPSTAN — Motor-driven, variable speed, for use with high-speed plastic extruders. Standard speeds of 100 to 1500 r.p.m. Higher speed gearing can be provided.

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TAKE-UP STAND — Automatically stops when dielectric faults are indicated by the SPARKER. Designed particularly for use with high-speed plastic covering machines.

AUTOMATIC RE-SPOOLER—Layer winds parallel cords. Has motor driven traverse with adjusting stops. Good not only for insulated wire, but for bare wire.

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Use the Reel that is Made With the

* Trade Mark Reg. ***"PRESSURE PAD" FASTENER**** ** Patent Applied for.

MOST IMPORTANT ADVANCE IN REEL CONSTRUCTION IN MANY YEARS

USED ON ALL HOWSAM MAGNET WIRE SHIPPING REELS.

Introduced in 1946, HOWSAM REELS of this construction have won wide approval throughout the wire industry.

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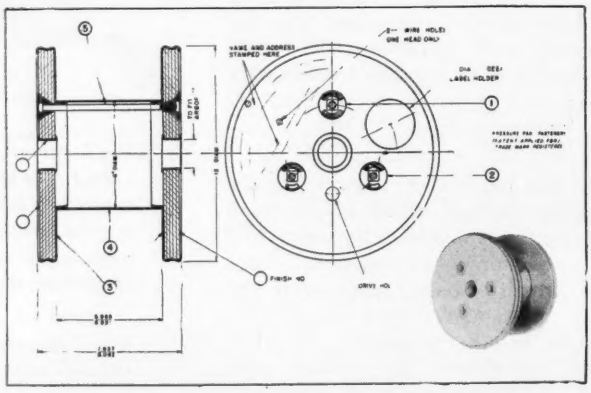

Line Drawing and Picture of The Howsam 12" Reel.

PHONE: 2-3043

HOWSAM SPOOL COMPANY

AURORA, ILLINOIS

tating units. These transmissions, with four fixed speeds, were manually operated and were provided with electrical interlocks so that it was necessary that all transmissions be in the same speed ratio before the drive could be started.

★ ★ ★

By the use of this system drive, the following speed ranges are available in a line of this type:—

Range #1 — 50 to 400 feet per minute
Range #2 — 100 to 800 feet per minute
Range #3 — 150 to 1200 feet per minute
Range #4 — 200 to 1600 feet per minute

★ ★ ★

Once any given range is selected for a particular type of wire, the main motor operated rheostats, one for wire speed and one for screw speeds, are operated from the main operating pulpit. This allows the operator complete remote control of both the speed of the wire and the speed of the tuber screw from a central operating station.

★ ★ ★

Most of the wire under direct consideration here was run in the last two speed ranges. Because of this high speed and because of the element of hazard involved in the operation, emergency dynamic braking is supplied with the D/C electric drive system. In the case of wire breakage from accidental causes, it is possible for the operator to stop the entire line under emergency conditions, thereby preventing damage to additional wire or to personnel who may be adjacent to the system at that time.

★ ★ ★

A drive feature such as remote acceleration control should also be considered. Through the use of this drive device, it is possible to automatically accelerate the wire to the same given operating rate at a predetermined speed condition without any attention on the part of the operator.

★ ★ ★

By combinations of motor-operated rheostat, pre-set speed control and dynamic braking, plus a very low threading speed, complete flexibility of the entire wire line was attained.

★ ★ ★

In order to localize all of the control adjuncts, including the temperature indicators for the tuber itself, the tuber screw load ammeters, the drive speed control and the wire handling speed control, these items were incorporated in one convenient operator pulpit. This operator pulpit is usually placed near the extrusion machine and as such, it provides one localized spot for the control of all of the facilities in the system. Solenoid valve control for the cooling water, spark tester control and interlock pilot lights are also localized on the panelboard.

★ ★ ★

There are several schools of thought in the matter of synchronizing the tuber screw with the wire speed.

★ ★ ★

Because of the fact that the delivery of the tuber is not a straight line function while the delivery in feet of wire per minute of the capstan is a lineal function, it is relatively difficult to automatically synchronize these two speeds continuously. Accordingly, in these particular installations, it was decided

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Get top results in your acid-cleaning operations—use Parkin products in your pickling.

With Parkin products, metal will come out of the bath quicker, cleaner, brighter . . . overpickling will stop . . . there will be less acid spray and fumes harassing the men.

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SAVE TIN!

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STANNOUS SULFATE

Use of Stannous Sulfate for liquor finishing baths saves tin, assures more efficient processing.

for **ALL LIQUOR FINISHING of STEEL WIRE**

white or straw color

M & T Stannous Sulfate provides these advantages:

- **Reduces tin losses by eliminating the high tin sludging common to the acidulated feather tin process.**
- **Makes it easier to control results because only two variables (the Stannous Sulfate and Copper Sulfate concentrations), require watching.**
- **Produces smooth, uniform, wire coatings from day to day and from lot to lot.**

Write for engineering data on the use of Stannous Sulfate in liquor finishing operations.

METAL & THERMIT CORPORATION
Specialists in Tin and Tin Chemicals
100 East 42nd Street • New York 17, N. Y.

that the tuber synchronization should be completely independent of the means of synchronization for the wire speed.

★ ★ ★

Likewise, because here also there is a requirement for handling polyethylene and nylon in the same tuber and the possible future use of polyvinyl chloride in the same machine, it was quite impossible to obtain synchronization of tuber screw speeds with capstan speeds. Accordingly, the tuber was equipped with its own D/C separately controlled drive with complete acceleration control located at the operator's pulpit. Thus, by means of electrical pushbutton for the wire speed and the extrusion speed, it was possible to synchronize both the speed of the screw and the speed of the wire for a given coating thickness. Additional synchronization was brought to a very fine point by the use of screw speed tachometers and capstan tachometers.

★ ★ ★

An efficient cable engineering department can, after a minimum amount of tests, deliver standards as to screw speeds, compound temperatures and wire speeds for any given wire condition. With such processing information available, it is very easily possible to determine, initially, all of the processing control conditions for the entire extrusion line.

★ ★ ★

Any extrusion system, in itself, is usually a simple operation. Tuber screw speed and temperature, wire speed, tension and cooling temperatures represent the main control elements. All of these elements are measurable and, therefore, controllable. Adequate wire drives and proper instrumentation of this operation is all that is usually required to assure high wire speeds, low scrap loss and maximum wire output.

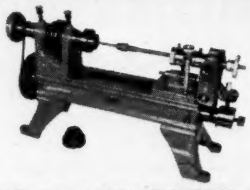
★ ★ ★

In the very short space of time allotted, it is quite impossible to go into the numerous details that are present in an operation of this type. It has been our purpose here only to describe some of the latest advances in the art of extrusion jacketing of wire and cable.

★ ★ ★

We trust this short talk has been interesting and informative to you.

NEW **ROOS**
DIE ROOM EQUIPMENT
SEMI-AUTOMATIC POLISHER



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Note these outstanding features for greater accuracy in polishing dies and for prolonged machine life!
(a) Quick opening spindle
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NEW STYLE TAILSTOCK
To Fit Other Model ROOS Polisher Model OT

NEW

MODEL OT

You can quickly and easily replace the tailstock on your old Roos Semi-Automatic Polisher with the New Model OT-Tailstock. Quotation on this new Tailstock furnished on request.

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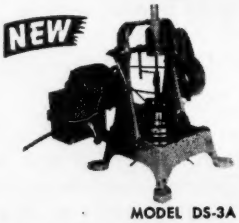
AUTOMATIC DIE SHAPING MACHINE

NEW 

MODEL DS-3A

Offers you three improved features: a die rotating attachment; a time switch; and a reversing switch—which provide these advantages:
1. Die rotating attachment and time switch eliminate the formerly necessary constant attention by operator. Rotation of die is automatic, and machine shuts off automatically at end of time cycle.
2. Reversing switch permits rotation of the die in either direction.

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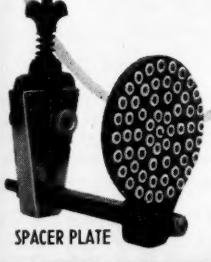
...and here's how to

GIVE YOUR PRODUCTION A NEEDED LIFT

Maybe YOU are trying to "lift" nothing but your output . . . or the *quality* of what you make; and if you make paper cord, shopping bag handles, wire, rope, cord, twine or thread the solution to your problem may be the installation of new, improved H-D equipment. *Worth investigating,* surely! Here you have equipment of *proven* performance—the result of eighty-two years' "know-how." Write TODAY for our new bulletins on twisters, ropers, layers, etc.



SPACER PLATE

HASKELL-DAWES MACHINE CO., INC.
2231 E. ONTARIO ST.,
PHILADELPHIA 34, PA.

Insulated Conductors in Canada

(*Continued from page* 483)

day all magnet wire manufacturers in Canada run this material in large volume and it is currently one of the standard magnet wires on the market.

★ ★ ★

The achievement in growth and technical development in the industry up to the War years was phenomenal and worthy of pride to anyone. However, the achievement over the next four or five years was actually even more outstanding.

★ ★ ★

You will remember our enforced natural rubber shortage and its general effect on automobile tires. Considering the absolutely fundamental importance of natural rubber for a major portion of our insulants this shortage should have stopped the industry dead in its tracks. This situation was even more vitally critical in view of our efforts to make wire for the Armed Services whose specifications called for "rich" or high percentage rubber compounds.

★ ★ ★

However, working with the newly developed synthetic rubber polymers first in the form of blends with natural rubber and then in new recipes using one hundred percent synthetic we not only stayed in production without disruption of our war effort but without impairment of service quality. This was in spite of working with new materials requiring special compounding to new recipes and was done simultaneously with re-writing the specifications to control the new materials because the old methods of measurement and evaluation were no longer entirely suitable.

★ ★ ★

We still used for these new compounds our existing process equipment but new techniques, temperatures and speeds had to be developed. Problems such as, "nerving" and smoothness of extrusion and control of cure had to be faced in production and at the same time we had to develop suitable electrical characteristics, suitable physical characteristics and suitable aging properties. All these were solved while maintaining production. During this period we actually made

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EXTREMELY FLEXIBLE!
FLAME RESISTANT!

You can be sure that New England lacquer will readily meet your most exacting coating requirements for television hook-up wire.

Let our specialized experience in the wire industry work for you!

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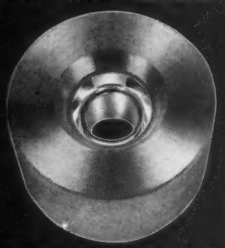
A COMPLETELY NEW, FASTER CUTTING DIAMOND ABRASIVE COMPOUND SPECIALLY DESIGNED FOR FINISHING CARBIDE



WIRE DRAWING DIES

HEADING DIES

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Six months of actual shop tests prove DYMO-C removes stock up to 20% faster than diamond powder—olive oil mixtures. In DYMO-C, mixing is eliminated . . . waste reduced . . . "slinging" minimized. Available in jars or applicator guns. Write today for complete information and free demonstration.

ELGIN DYMO DIAMOND COMPOUND . . . pure diamond—crushed, precision graded and compounded by one reliable source—ELGIN. Guaranteed to conform to U.S. Bureau of Standards specifications.

INDUSTRIAL PRODUCTS DIVISION
ELGIN NATIONAL WATCH CO.
ELGIN, ILLINOIS

synthetic low-loss insulations for aircraft ignition cable applications and low moisture absorption synthetic compounds for special requirements. As a matter of fact arising out of all this development and experience came compounds which are still very much in use today and crude rubber has not been able to supplant the synthetic polymers for these compounds.

★ ★ ★

It is not intended here to minimize the excellent work done by Polymer Corporation and other suppliers of the synthetic polymers in this difficult period. Their efforts of course, were as great as those in the Wire industry and quite as successful in developing the polymers themselves. However, since this is a Wire paper it seems logical to highlight the efforts and successes on the part of the Wire industry.

★ ★ ★

This same rubber shortage gave extra impetus to the development work on the plastics. These are not synthetic rubbers but are elastomers which should properly be called rubber substitutes. They have inherent properties not possessed by rubber compounds foremost of which is complete resistance to oxidation rendering them practically ageless as far as normal depreciation is concerned. They are nearly all thermoplastic and will flow at elevated temperatures but happily are perfectly useable in the normal temperature ranges of operation.

★ ★ ★

These plastics filled a very real need by the Services. For instance we made literally thousands of miles of field telephone wire for the British and the Canadian armies. This volume of material allowed full scale production development of the insulating compounds themselves and full scale production development of extrusion and handling techniques on wire in our factories. From this point onward the industry never looked back.

★ ★ ★

Plastics are now doing the specialty job for which they were originally designed better than ever before and volume methods have so reduced costs that their special

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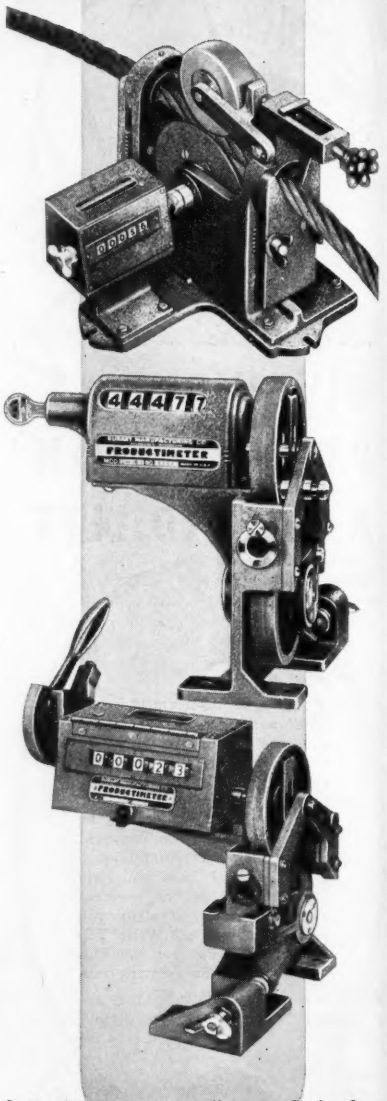
WIRE MEASURING MACHINES
Fast . . Accurate . . Dependable . . Legible



Productimeters measure all types of wire from .010 to 1½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work". . . insure profitable operation in your plant.

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properties are being used to advantage in standard building-wires and in standard flexible cords. New products widening the temperature range at which plastics will operate are continuing to appear, so that specially low and specially high temperature compounds are now available.

★ ★ ★

Another extremely interesting dielectric material which is also a thermoplastic was developed during the war and first manufactured in Canada in 1941. This polythene or polyethylene was in short supply and restricted to Service high frequency low loss applications in radio work. Here too an outstanding job was done supplying extremely important Service requirements while developing production techniques and quality levels for an entirely new material. This material too is now finding its permanent part in applications for Insulated Conductors and volume production has brought costs in line for successful competition with the old standard materials. This plastic has particular value for low loss applications in general and television work in particular.

★ ★ ★

Of course, new synthetic rubbers are continuing to appear from the Laboratories. New thermoplastic formulations are continually being developed, new synthetic enamels are continually being evaluated and entirely new (but so far expensive) insulating materials developed in the Laboratories are of absorbing interest. Any of these could be as revolutionary ten years from now as P.V.C., polyethylene, or polyvinyl acetal enamel were when they appeared. These developments are, however, not historical **yet!**

★ ★ ★

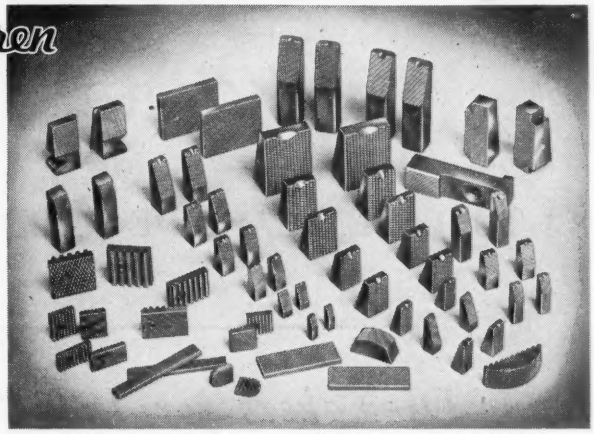
Currently in Canada ten companies combine to supply the Insulated Conductor needs of the country and these needs according to 1949 Bureau of Statistics figures amounted to $85,784,882.00.

★ ★ ★

Using copper mined and refined in Canada billets are rolled into rod drawn into wire, stranded and insulated in all the types and volt-

Sjogren

JAWS . . . . for Wedge Grips, Pullers and Tensile Testing Machines of all makes are available either from stock or manufactured to order. A Sjogren jaw, made to meet your requirements, guarantees you service.



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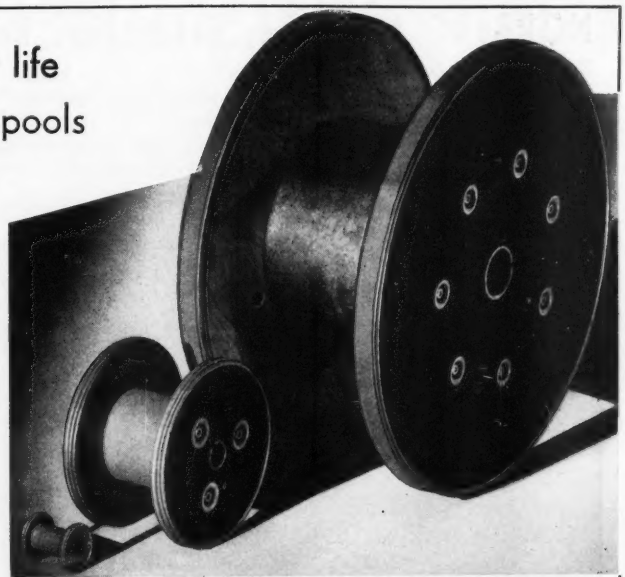
Represented in Canada by THE LARSON CO., 98 Wellington St., West, Toronto, Ont.

for longer life shipping spools and reels



Hubbard metal bound spools and reels for shipping are ruggedly built to withstand all the shock and impact normally found in transporting spooled wire. Head is plywood with die formed steel tire. Design provides a light weight spool or reel with long wear life. Write for information and prices.

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NORBIDE Abrasive: Effective, Economical

This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

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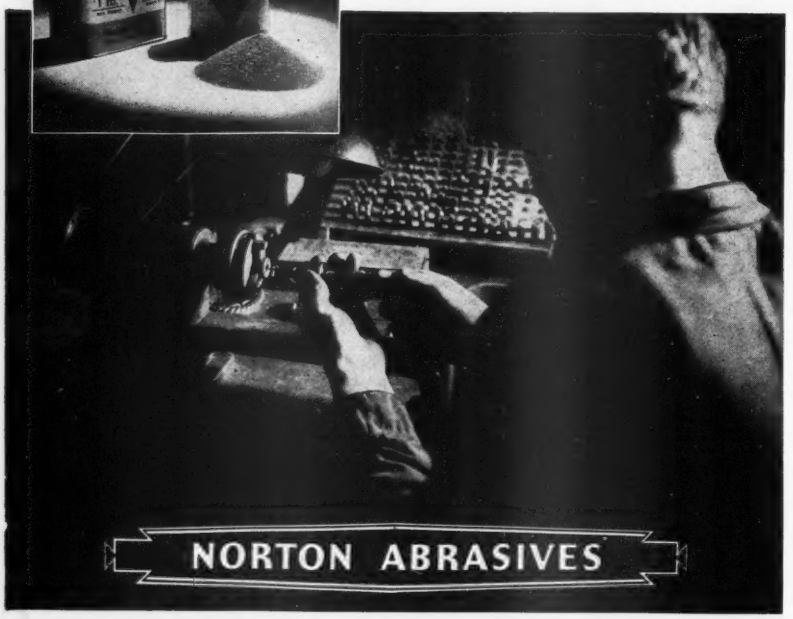

ages required by the country. The production and design is by our own technical personnel and no conductor from the finest copper or alloy through shaped synthetic enamel magnet wire, portable cords, power cables to the largest high voltage underground cables is missing from the list available. It will be conceded that the Canadian Insulated Conductors business from its small start in 1887 has fully kept pace with the growth and needs of the country itself.

★ ★ ★

THE OCTOBER CONVENTION ISSUE

Your advertising in the October issue of WIRE AND WIRE PRODUCTS is a must. This important number of the magazine carries preprints of technical papers to be presented at the Annual Wire Association Convention and other convention features. Due to its long life and high reference qualities your advertising in October has exceptionally high value. Make your plans now to be represented in this very special issue.

The Canadian Regional Meeting

(*Continued from page* 479)

publication two years later. Out of the latter's efforts to develop the paper, he pointed out that a group of men, such as the late **William Pearson** of the Waterbury-Farrel Foundry and Machine Company, the late **John Mordica** of Bethlehem Steel Company the late **George Hartley** of Sleeper and Hartley, **Kenneth B. Lewis** and others, assisted materially in helping to secure editorial material, which finally led to the organization of the Wire Association, the first meeting of which consisted of thirty men. He then called upon the three present who had had so much to do with the establishment of both the Magazine and the Association to stand—they were **Richard E. Brown, Mrs. R. S. Spengel** and **Kenneth B. Lewis.**

★ ★ ★

The principal speaker of the evening was **Dr. H. G. Thode,** Principal of Hamilton College, McMaster Uni-

versity, whose talk was descriptive of the research work carried on at the University on isotopes.

★ ★ ★

Friday, the 20th, was devoted entirely to technical sessions, with papers as follows: **"Insulated Conductors in Canada"** by **J. P. Watts,** Canadian General Electric Company; **"Some Developments in Nylon and Polyethylene Wire Extrusion"** by **C. A. Litzler,** Industrial Ovens, Inc.; **"Wire for Fasteners"** by **S. W. McDermott,** Steel Company of Canada; and a panel discussion on **"Electric Drives in Wire Mills"**, participated in by **R. A. Duke** Canadian Westinghouse Company, **Richard Guter,** Reliance Electric and Engineering (Canada) Co., and **D. McCready,** Steel Company of Canada. **C. G. Taster** of the Steel Company of Canada served as discussion leader.

★ ★ ★

The Program Committee has earned the thanks of the Association for their fine work in producing so well-rounded and instructive a meeting, as well as the lasting satisfaction that their efforts were well-received and highly appreciated by both the officers and the members of the Association.

★ ★ ★

Two New Books on Employee Relations

The National Foremen's Institute, Inc., New London, Conn., has two books that should help to keep employer-management relations on a good footing.

★ ★ ★

One of these: "Formula for Supervisions" is a manual for supervisors and executives. It tells how to identify the problem, to locate and verify the reason, select the remedy and to apply the remedy. 96 pages; price: $1.00.

★ ★ ★

The others: "114 Check Points on How to Prevent Grievances" is a practical book on how to cope with the outward manifestations of something wrong underneath. It helps to stimulate the thinking of responsible executives so that answers to difficulties may be secured. 36 pages; price: $1.00.

★ ★ ★

IMMUNOL ...And Any Water Prevents Looping And Rusting in a Single Operation!

Coils of wire dipped in an IMMUNOL solution before spooling are freed of caking and stickiness which cause looping. Wire is clean and free running as it goes on the spool, and at the same time is protected from rust by a non-oily, invisible film of IMMUNOL. Rust formation on the machines during weaving is prevented as well.

IMMUNOL is neutral, non-inflammable, odorless and will not affect the skin. Mixes readily with any kind of water to make a safe, practical, easy to handle solution.

Outstanding for use as a rust preventive, detergent and wetting agent for all types of cleaning and rust prevention. Ideal for protection of wire in packaging or indoor storage where clean, invisible non-oily film is desired. Send for booklet.

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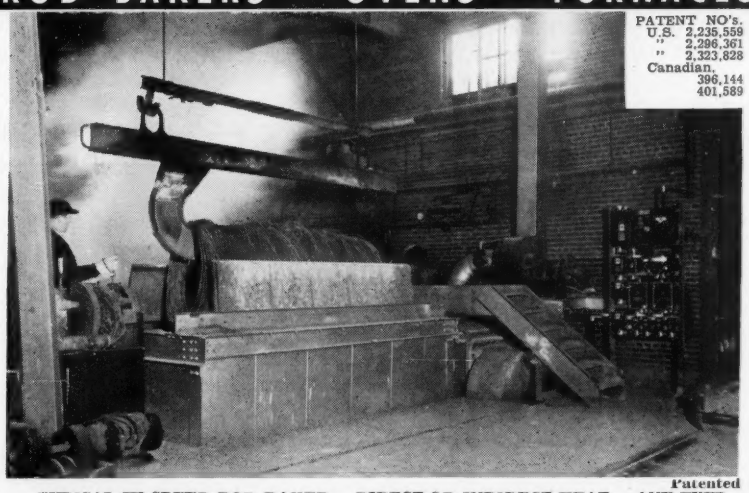
ROD BAKERS - OVENS - FURNACES



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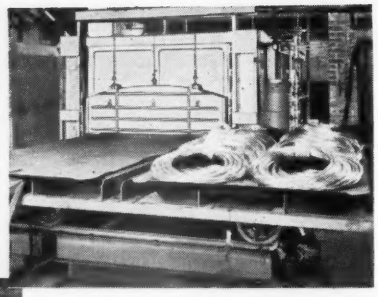
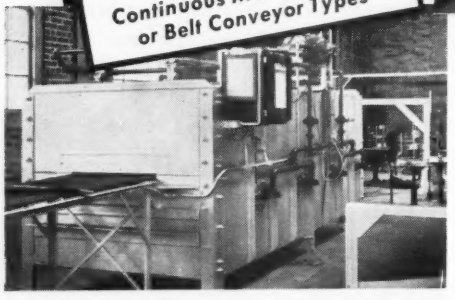


Gas-fired, atmosphere controlled, pan type batch furnace for annealing brass wire in coils.



Gas-fired furnace for bright annealing steel, stainless steel and non-ferrous wire running continuously through tubes in furnace.

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New Carboloy Bulletin

A bulletin giving a case history on results a customer has obtained from using Carboloy dies in manufacturing "Speed Nuts" has been published by the **Carboloy Company**, 11122 E. 8 Mile Rd., Detroit 32, Mich. Our readers are welcome to copies of this interesting bulletin. Please write for one.

★ ★ ★

DPA Procurement Policy to Increase Small Business Participation

The Defense Production Administration has announced adoption of a new four point procurement policy to increase participation of small business in defense production.

★ ★ ★

The policy has been accepted by all government agencies concerned with defense procurement and production. The policy was developed by the DPA Production Executive Committee jointly with the DPA Small Business Executive Committee composed of representatives of defense agencies concerned.

★ ★ ★

The new policy is the result of many weeks of study and discussion by government officials, including consultation with officials of both large and small firms throughout the country. The four points are as follows:

★ ★ ★

1. To bring into the defense effort on a prime contract, subcontract or purchase part basis every qualified producer who can be used so that orders can be spread across as wide a base as possible.

★ ★ ★

2. To find out and put to use the productive facilities of small firms.

★ ★ ★

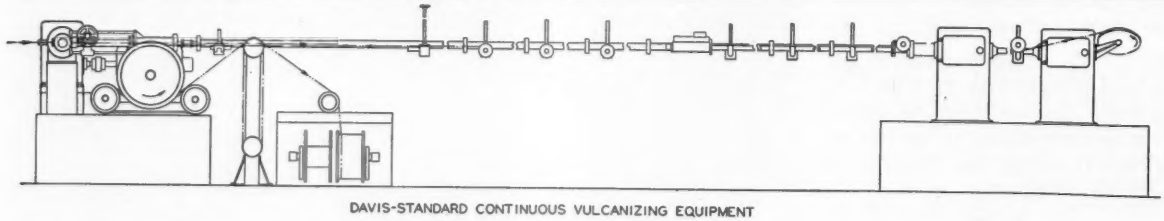
3. To give small manufacturers all necessary information concerning Government needs and the steps they should follow in obtaining subcontracts as well as prime contracts.

★ ★ ★

4. To develop and install procurement procedures which will encourage prime contractors to subcontract to small firms the maximum amount of business possible.

★ ★ ★

Contracting officers will be required to state in bids on negotiations whether or not additional facilities, buildings, or equipment, are



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COMPLETE CONTINUOUS-VULCANIZING UNITS

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necessary to fulfill the orders. The intent is to channel the business through existing facilities before the expansion of facilities is considered by the bidder.

★ ★ ★

The chairman of the Small Business Executive Committee is John C. Pritchard, Deputy Administrator for Small Business, Defense Production Administration.

★ ★ ★

To Manage Sales Personnel and Organization for A.S.&W.

Appointment of **Lloyd G. Depner** as manager of sales personnel and organization of **American Steel & Wire Company** has been announced by **Wilmer H. Cordes**, general staff manager of this U. S. Steel subsidiary's general sales department.

★ ★ ★

Mr. Depner's new assignment represents addition of sales organization duties to his previous responsibilities. He has been manager of sales personnel since 1947.

★ ★ ★

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CUTTER

For FREE CUTTING of wires, cable, rods, baling wire and bolts up to medium hardness.

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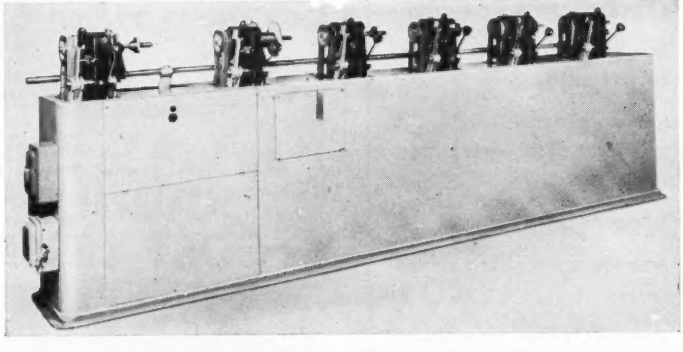

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AMERICAN CHEMICAL PAINT COMPANY
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Du Pont Dedicates New Experimental Station Laboratories

The Du Pont Company formally dedicated its new research laboratories in Wilmington on May 10th, the visitors including more than 200 leading scientists, research men and scientific writers.

★ ★ ★

The tour of the Polychemicals Department laboratory equipment for plastics research was shown and demonstrations of certain of it carried on. In one demonstration, visitors were shown the newly developed methods for applying coatings of "Teflon" tetrafluoroethylene resin to electric wire.

★ ★ ★

A thin film of "Teflon" may be extruded onto wire, by use of a paste made from a mixture of finely powdered "Teflon" and an organic liquid. This was shown in a motion picture. The process involved subsequent evaporation of the liquid in a furnace and heating the plastic particles until they fused together into a tough continuous film. It was explained that, while the extrusion

Apco...

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REELS
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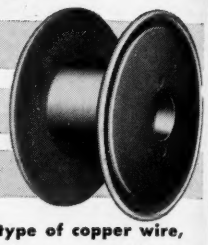

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LIME
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WIRE DRAWING

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Philadelphia—Pittsburgh—New York

rate was "painfully slow" in comparison with rates for the more ordinary thermoplastics, it was justified by the unique properties of "Teflon" and represented a tremendous advance over previous methods for extruding "Teflon." This plastic has better resistance to chemicals than any known organic material, can continuously resist temperature up to 550 degrees F., and makes an outstanding high-frequency electrical insulation.

★ ★ ★

An experimental method for coating wires with relatively thick layers of "Teflon" was also demonstrated. After considerable research, which is still in progress, it was found that "Teflon" powder could be pressed onto wire by passing it through grooved rolls and that, after baking to fuse the particles, the coatings were tough and free from flaws. The audience was shown how a number of wires can be coated simultaneously by this method, and how conductors of various shapes can be coated by using rolls with shaped grooves.

★ ★ ★

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HARD DRAWN STEEL WIRE
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SIZE: coils, spools or straightened cut to length.
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TYPE: stone wire, bookbinder, flat, etc.

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WICKWIRE BROTHERS, INC. CORTLAND, N.Y.

J. G. SURMACZ Named Chief Industrial Engineer at P&H

Joseph G. Surmacz has been named to the newly created position of Chief Industrial Engineer of **Harnischfeger Corporation,** it is announced by **Herman Menck,** Vice President and Works Manager. In this new position Mr. Surmacz will be in charge of production control.

★ ★ ★

Before joining P&H, Mr. Surmacz was Chief Industrial Engineer with the Ingersoll Steel Division of Borg-Warner in Chicago and with the American Steel & Wire in Pittsburgh. Mr. Surmacz has appointed David A. Drewery to assist him as Plant Industrial Engineer.

★ ★ ★

CHICAGO, ILL.—The Wire Association Annual Convention, October 22-25, 1951 at the LaSalle Hotel. Ralph B. Roth, Ludlow-Saylor Wire Co., Chairman of Program Committee. Please mark these dates on your calendar now. Full details will be published in WIRE AND WIRE PRODUCTS in July.

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- **—is clean, safe, and easy to handle.**
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- **—is reported as giving increased die life.**

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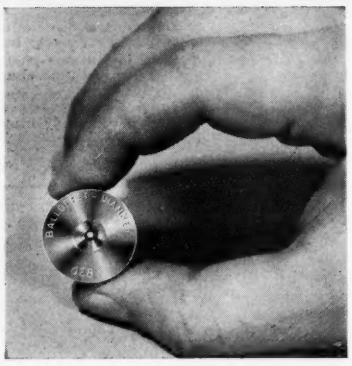

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Magnethermic Names Denton and Anderson for Northeast

Magnethermic Corporation, 701 Andrews Avenue, Youngstown, Ohio, announces the appointment of **The Denton & Anderson Company,** 259 Main Street, Stamford, Connecticut, to represent them in the New England States, Northern New Jersey and Eastern New York.

★ ★ ★

Magnethermic low frequency (60 cycle) induction heaters are used extensively in the extrusion, forging and rolling of aluminum, magnesium and copper alloy billets and bars. Economies of the low frequency heating method are said to be phenomenal, with uniform temperature, diminished scaling and improved metallurgical properties as added advantages. Typical heating speed: 6" dia. aluminum billets brought to 850° F. in 60 seconds.

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New Tachometer for Wide Speed Ranges

The Metron Instrument Company has made available a new three range, single head, fixed installation tachometer indicator for speed measuring applications where a particularly wide range of speed measurement is desired. This new instrument, Series 42P, can be used with any series Metron Tachometer Head.

★ ★ ★

Simple rotation of the indicator range knob instantly selects one of three speed ranges to measure any speed over a total range of 40 or 50 to 1, based on readings down to 1/10 full scale of the lowest range. The ranges are carefully chosen for ease in reading, and the scales are all a full 4 inches long with 100 divisions. Indicator calibration is stable indefinitely and good over a wide temperature range. However, calibration is easily adjustable in the field. Scales are supplied for direct reading in any units such as RPM, FPM, INCHES/SEC., or in any quantity which is proportional to the speed actuating the head. Various tachometer heads permit direct measurement ranges from speeds between ½ RPM and 100,000 RPM without requiring a speed changing drive of any kind.

Metron's New Tachometer.

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The indicating meter is of rugged design and is mounted in sponge rubber. With ordinary open wires,

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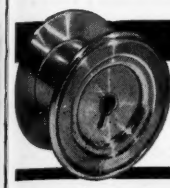
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the indicator can be located up to 1000 feet from the head without materially affecting calibration. Selection of the wrong range or otherwise overspeeding does not damage the indicator.

★ ★ ★

Carboloy Develops Carbide Tipped Drills

Comprehensive laboratory tests, followed by actual production applications over extended periods of time, have demonstrated that cemented carbide twist drills can drill holes in cast iron at least twice as fast as high speed steel drills. At these higher speeds, drill life is roughly three to four times that of steel drills.

★ ★ ★

In addition, carbide drills can be used to advantage even where increased speeds are not possible, it has been demonstrated. Operating at the same speeds they give a **tool life around 10 times that of high speed steel drills.**

Carboloy Carbide Tipped Drills

★ ★ ★

A typical carbide-tipped twist drill such as was used in the laboratory tests and also used in routine production applications is shown in Fig. 1. The drill is made simply by inserting a standard carbide twist drill tip, grade 44-A (Fig. 2), in the end of a conventional high speed steel twist drill.

★ ★ ★

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Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

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American Insulating Machy. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp, The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
American Steel & Wire Company, Cleveland, Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F., Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

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Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland Ohio.
Holden, A. F., Company, The, Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
Youngstown Welding & Engineering Co., Youngstown, Ohio

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, O.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Techema Co., The, Toronto, Canada

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Company, Industrial Products Division, Elgin, Ill.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
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Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVES
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Diamond Tool Research Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Diamond Tool Research Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Industrial Products Division, Elgin, Ill.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Claire Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING
Danforth, The C. W. Co., Youngstown, Ohio
Diamond Tool Research Co., New York, N. Y.
National Research Company, St. Claire Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

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Diamond Tool Research Co., New York, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Metal Carbides Corporation, Youngstown, Ohio.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hartley Tool & Die Co., Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
American Carbide Die Company, Union City, N. J.
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

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DIES—Special Shapes, Etc.
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England.
Sjogren Tool and Machine Co., Inc., Auburn, Mass.

DIES—Tantalum Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tube Drawing
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tungsten Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Division, Republic Steel Corporation, Niles, Ohio

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting
Copper—Leonard D. Walde, North Plainfield, N. J.
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Spring Design—Carlson Co., The, New York, N. Y.
Wire Mill—Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

IMPREGNATING MATERIALS—
Standard Varnish Works, New York-Linden, N. J.-Chicago

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Works, New York-Linden, N. J.-Chicago
Twitchell, E. W., Philadelphia, Pa.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Merrimac Paper Co., New York, N. Y.
Twitchell, E. W., Philadelphia, Pa.

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.
Standard Varnish Works, New York-Linden, N. J.-Chicago

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Roos, Tool & Mfg. Co., Montclair, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wafios, Machinenfabrik, Württ., Germany
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Bolts & Rivets
Meyer, Roth & Pastor Machinenfabrik, Koln-Radderberg, Germany

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
Cook, Edw., Machy. Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Meyer, Roth & Patsor Machinenfabrik, Koln-Radderberg, Germany

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wafios, Machinenfabrik, Württ., Germany
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Cook, Edw., Machy. Co., Wallingford, Conn.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
Meyer, Roth & Pastor Machinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Machinenfabrik, Württ., Germany
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio

MACHINERY—Pin Making
Meyer, Roth & Pastor Machinenfabrik, Koln-Radderberg, Germany

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Mach'y Exch. (Used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Lundahl Corp., Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Machinenfabrik, Württ., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Machinenfabrik, Württ., Germany

MACHINERY—Straightening & Cutting
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
Meyer, Roth & Pastor Machinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Norsholm Industries, Rochester, Michigan
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Forming
Wickman, A. C., Ltd., Coventry, England

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
Lundahl Corporation, Hartford, Conn.
Scott Testers, Inc., Providenec, R. I.

MACHINERY—Testing Equipment—Electrical
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Manson Laboratories, Stamford, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I. (used)

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Marshall-Richards Machine Company, Inc., Trenton, N. J.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook, Edw., Machy. Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Winding Wire
Federal Manufacturing Co., Wallingford, Conn.
Standard Mill Supply, Pawtucket, R. I.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio
Davis, R. L. Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Standard Machine Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Kurt Orban Co., Inc., New York, N. Y.
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Svenska Telegrambyran (Morgardshammer), Stockholm, Sweden
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Kilmer, M. D. & Co., Cleveland, Ohio.
Meyer, Roth & Pastor Machinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Machinenfabrik, Württ., Germany

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc, Cortland, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.

OVENS—Dehydrogenizing
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio.
Standard Varnish Works, New York—Linden, N. J. —Chicago

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.
Standard Varnish Works, New York—Linden, N. J. —Chicago

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See Wind-up and Unwind Systems)

PHOSPHATE COATING CHEMICALS
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS—
Entwistle, Jas. L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

PRESSES—Hydraulic and Mechanical
Standard Machinery Co., Mystic, Conn.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

REEL AND TENSION STANDS—
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Proctor Reels, Proctorville, Vt.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Proctor Reels, Proctorville, Vt.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.

REELS—Pay-off
Norsholm Industries, Rochester, Mich.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Proctor Reels, Proctorville, Vt.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

WHERE TO BUY, Continued

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Proctor Reels, Proctorville, Vt.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
(See Ovens—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.

RODS—Wire—Non-Ferrous
American Brass Co., The, Waterbury, Conn.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Montan Export, Inc., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J
U. S. Steel Export Co., New York, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Co., The, Detroit, Mich.
Houghton, E. F. & Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Du Pont de Nemours, E. I. & Co., Electrochemic l Dept., Wilmington, Del.
Holden, A. F., Co., The, Detroit, Mich.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

TANKS—Steel
Chemsteel Construction Co., Pittsburgh, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TIES—WIRE—
(See Wire Ties)

TINNING PROCESS—
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Wire
(See: Tinsel—Electric Conductor)

TOOLS—Spring Forming
Lundahl Corporation, Hartford, Conn.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, Jas. L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.
Standard Varnish Works, New York-Linden, N. J.-Chicago

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Alloy
Montan Export, Inc., New York, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., Cleveland, Ohio.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Montgomery Co., The, Windsor Locks, Conn.

WIRE Manufacturers
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Montan Export, Inc., New York, N. Y.
Newbury Company, The, Boston, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., S n Francisco, Calif.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Montan Export, Inc., New York, N. Y.
Newbury Company, The, Boston, Mass.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Malin & Co., Cleveland, Ohio.
Chase Brass & Copper Co., Waterbury, Conn.

WIRE—Non-Ferrous to Specifications for Special Purposes
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Cleveland-Chicago, New York.
Chase Brass & Copper Co., Waterbury, Conn.
North American Philips Co., Inc., New York, N. Y.

WIRE—Spring
American Brass Co., The, Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., S n Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Newbury Company, The, Boston, Mass.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Specialty Wire Co., Inc., Worcester, Mass.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., New York, N.Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Weaving (Non-Ferrous)
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.

WRAPPING PAPER—Creped
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N.J

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY MANUFACTURERS

WATSON

TAKEUPS TYPE-"DC"

The "Original" Continuous Uniform Tension Design with a Fifteen Year Performance Record and in World-Wide Use.

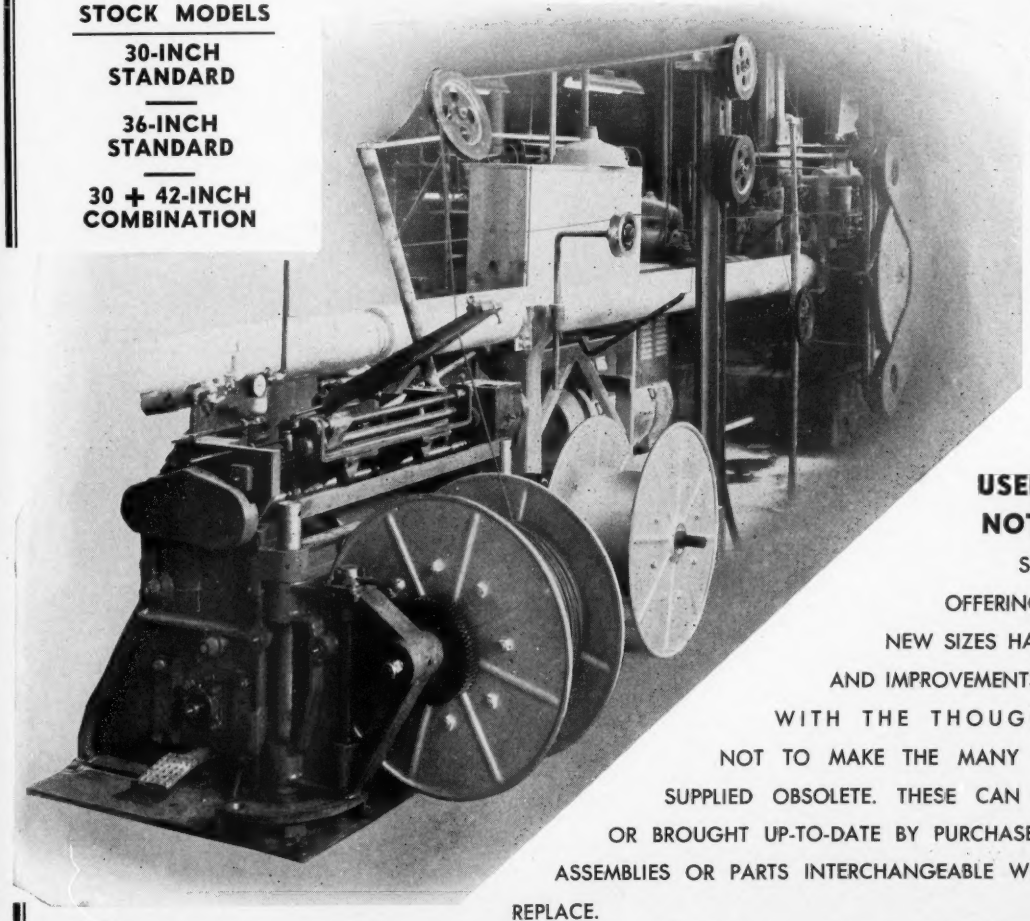
AVAILABLE IN MANY SIZE AND MODEL COMBINATIONS. CAPSTAN DRIVEN OR SELF-POWERED. MEETS ALL SPEED-TENSION REQUIREMENTS AND HANDLES A VARIETY OF SHOP REELS. LOCATES TO SUIT CUSTOMER'S PREFERENCE. SIMPLEST CONTROLS. NO OUTSIDE SERVICE REQUIRED. ALSO OBTAINABLE FROM PROMINENT EXTRUDING MACHINERY MANUFACTURERS. MODERATELY PRICED. DELIVERIES FROM STOCK—OR—AS REQUIRED.

STOCK MODELS

30-INCH STANDARD

36-INCH STANDARD

30 + 42-INCH COMBINATION



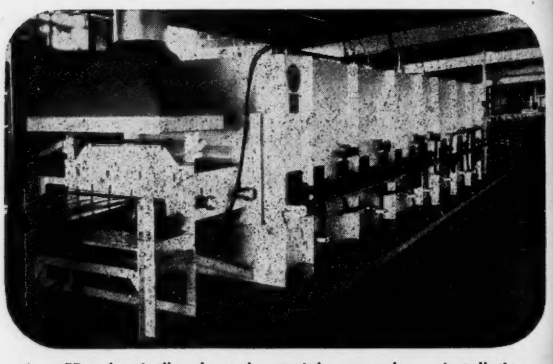
AN EARLY MODEL 30-INCH "DC" TAKEUP SHOWN HERE INSTALLED ON THE OPERATING SIDE OF A **"ROYLE"** CONTINUOUS VULCANIZING MACHINE (W-3102)

USERS PLEASE NOTE:

SINCE OUR FIRST OFFERING OF THIS TYPE, NEW SIZES HAVE BEEN ADDED AND IMPROVEMENTS MADE ALWAYS WITH THE THOUGHT IN MIND NOT TO MAKE THE MANY UNITS ALREADY SUPPLIED OBSOLETE. THESE CAN BE CONVERTED OR BROUGHT UP-TO-DATE BY PURCHASE OF NEW SUB-ASSEMBLIES OR PARTS INTERCHANGEABLE WITH THOSE THEY REPLACE.

30-Inch Standard Models Available for Prompt Shipment

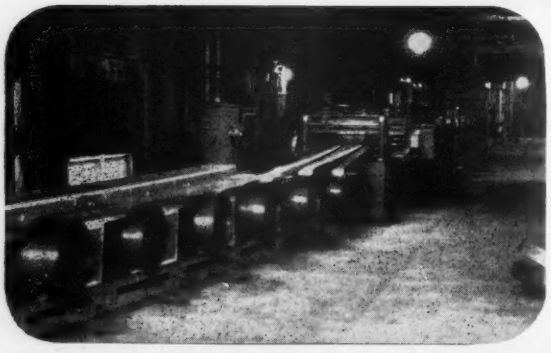
Steel strip in single or multiple strands up to a total width of 54" may be bright annealed or normalized, continuously, in this EF gas fired radiant tube installation. Capacity 7200 lbs. per hour.



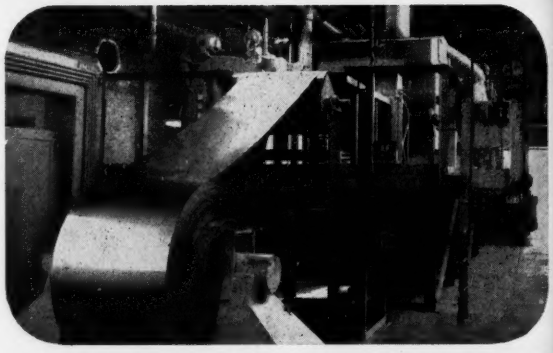
An EF electrically heated special atmosphere installation bright annealing six parallel strands of cold rolled steel strip, continuously. Handles single or multiple strands up to a total width of 30".

SOME TYPICAL EF INSTALLATIONS

For Processing Strip



Another EF gas fired radiant tube, continuous furnace for bright annealing or normalizing cold rolled strip steel. Has preheater or burn-off chamber and handles 2000 lbs. strip per hour.



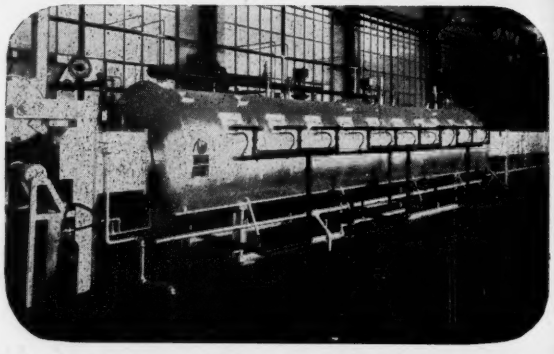
An EF special atmosphere furnace with flame preheating burn-off or oxidizing section, and controlled heating and cooling zones for producing various surface conditions on strip steel.

Designed and Built by

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process Product or Production

This EF combination fuel fired and electrically heated strip processing unit provides extreme flexibility in heating, soaking and controlled cooling cycles for treating various grades of strip.



Stainless steel strip is bright or process annealed continuously in this EF gas fired special atmosphere tube muffle type furnace. It also handles other strip requiring lower temperatures.

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